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A TREATISE

ON THE

SCIENCE AND PRACTICE

OF

MEDICINE

OR THE

PATHOLOGY AND THERAPEUTICS

OF

INTERNAL DISEASES

BY

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TO

THOSE WHO HAVE LISTENED TO THE ORAL INSTRUCTION GIVEN DURING
THE LAST THIRTY YEARS BY THE AUTHOR,

THIS WORK IS RESPECTFULLY

DEDICATED.

PREFACE.

In adding a new work on the Science and Practice of Medicine to the number already claiming the attention of the American profession, it seems proper that some reasons should be given for having undertaken its production, and some justification should be offered for its existence.

The preparation of such a work has been long in contemplation, suggested by the requests of students, and their evident want of a text-book to follow the lectures on this subject in the Medical Schools with which the writer has been connected. The task has finally been executed, in compliance with conditional promises made to students, and to numerous practitioners who had formerly attended these schools, and who have expressed a desire to have the substance of the teaching they had received, in a more precise and permanent form, for reference and study.

There are other reasons, however, than the partiality and wishes of former and present students, or the wants of prospective ones, which may be adduced to favor the claims of this work to a place, whatever place that may be, in our literature.

That the few domestic treatises on the Practice of Medicine are not sufficient to fully supply the wants of the reading American profession is evident from the large number of foreign works which are reproduced and purchased among us.

Judicious members of our profession, and especially those who have observed medical practice abroad, and who have given attention to the peculiarities of diseases, and the treatment required for them as they occur in different localities, and in persons of different races and habits, are very seriously raising the question whether therapeutical directions given by foreign authors are the best, if they are even safe guides in the treatment of the ordinary diseases in this country. In the International Medical Congress, recently held in London, the statement was made, and accepted without dissent, that each nationality had its own peculiarities of disease, requiring peculiarities of treatment; and climatic influences, as different as they are upon the two continents, must, at least in many cases, vary the remedial measures indicated.

Moreover, not only do race and climate produce differences in diseases, requiring modifications of treatment, but the *habits* and the particular surroundings of the people produce still greater effects. The habitations, the clothing, the exposure, the food, the drinks, the labor, the pleasures and the dissipations, and all the social and domestic arrangements, differ widely in Europe and in this country.

But these are not all, or the chief reasons, why the conclusions and practical directions of the authors of foreign works cannot be accepted as proper guides to be fully followed in the treatment of the ordinary medical diseases of our general population.

The authors of these foreign works have derived their experience, upon which conclusions are based, from a consultation practice in large cities, and from attendance upon patients in large city hospitals. In consultation practice, certainly as a rule, the consultant sees acute diseases either in their severer forms or in their later stages, and most frequently he is called to the severer cases at a stage when the time for most efficient treatment has passed, and when the remedies indicated at the beginning of the affections, with a view to their arrest, are no longer applicable.

In a large metropolitan hospital the conditions of the patients differ still more from those met with in the ordinary practice in this country. The foreign hospital patients, especially those affected with acute diseases, are almost exclusively from the destitute and the starved, or from the intemperate and the degraded classes. They live, for the most part, in narrow, filthy lanes, in crowded tenements, in cellars, or in garrets; they have not only insufficient food, but generally they indulge in poisonous drinks, and are very often suffering from specific diseases produced by vice. Furthermore, especially in acute cases, they are brought into the hospital and to the notice of the physician after the earlier stages of the diseases have passed. As a proof of this fact, it may be mentioned that in the standard foreign works giving the average daily temperatures of acute pneumonia, as derived from the observation of numbers, the record generally commences with the fourth or fifth day of the disease, because many have not been seen at an earlier period. These facts explain the prevailing skepticism among these authors as to the efficacy of remedies, and their failure to appreciate their effects when early given.

It requires no argument to show that the cases they deal with differ vastly from those occurring in an ordinary American village or country situation, where well-housed, well-fed, non-alcoholized people are seen in the beginning of their diseases. The treatment adapted to the respective cases must be quite different, and the natural course of the disease must vary; and yet the statistics of the effects of different modes of treatment, as by blood-letting, antimony, alcohol, quinine, the bath, expectancy, etc., are based upon these hospital cases; and these and the cases seen in consultation, largely, if not exclusively, control the views of those who write the foreign books.

The present work has been prepared from the standpoint of an American physician, whose practice for years was in a village and farming community, who has become familiar with diseases in their beginning as well as in their advanced stages, both in a country and a city practice—more in the West, but also in the East; in the army during the late war, as well as in civil life—from the standpoint of one who for years has been engaged in public clinical and hospital, as well as in private practice; who has long acted as a consultant as well as an attending physician, and whose observations have extended to the large city hospitals of our own country; and who, years ago, as well as since this work has been in preparation, has made brief but careful observations in most of the medical centres of Europe.

So varied an experience and so extended a field of observation, and an acquaintance with professional men of different special pursuits and different opinions on a variety of questions, it may be presumed, has tended to prevent narrowness of views and prejudiced judgments; and whatever may be thought of the opinions contained in the work on important practical subjects, they have not been hastily formed, nor without opportunities of investigation. The differences between the diseases of our own and the countries of Europe, of the rural districts and the crowded cities, and of those met with in private and in hospital practice, have been recognized; and the importance and greater efficiency of early treatment, and the differences in the indications presented and the remedies required in the early and later stages of most affections, have been pointed out.

The time for a strictly scientific classification of diseases has not arrived, and in the arrangement of subjects convenience has been followed rather than any attempt made at such a classification. As the most natural order, however, certain physiological and pathological facts and principles have been first presented, elementary morbid changes are next described, and an account of particular general diseases follows. Local diseases are then treated of, beginning with those of the digestive organs; the accounts of the diseases of other systems of organs follow, closing with the complex affections of the nervous system. An account of human parasites is added, and a description of the internal diseases they produce closes the work.

Imperfections of various kinds unquestionably there are, which will be readily observed. One busily engaged in professional duties must have been on the alert to have kept pace with the progress which pathology and therapeutics have made within the past few years, and some new facts and principles of importance fairly established may have been overlooked; but many theories that have received attention but are not proven, and alleged facts of apparent importance but not authenticated, have been purposely omitted.

A work aiming to give a general view of the present state of scientific and practical medicine cannot be entirely original. The writer of such work must draw materials from numerous sources, and it is often difficult to determine to whom the credit of originality should be given. In the haste of preparation acknowledgments may not always have been made where they were justly due. Much of the matter was collected for use in the lecture-room, and this has sometimes been made available in this work without referring again to its sources. It has, however, been the purpose to give proper credit for all materials made use of which cannot be regarded as the common property of the profession. The recent general works on medicine of Drs. Flint, Bartholow, Bristowe, and M. Jaccoud, have been frequently consulted, as well as a large number of monographs upon particular subjects, such as are contained in Reynolds' System of Medicine and Ziemssen's Cyclopædia, as well as those which have been published separately or have appeared as articles in medical journals. To all these acknowledgments are due.

Not having myself been devoted to original work in morbid anatomy, the description of anatomical and histological changes partakes of the character of a compilation from the more recent and reliable sources; while the therapeutical views are more of a personal character, although the opinions and authority of others have not been ignored. When stated without reference to authorities, they are such as study, observation, and experience have enabled me to express as personal convictions.

While pathology is recognized as the foundation of scientific medicine, and symptomatology and diagnosis as essential guides in the care and management of the sick, the practical cure of patients must be regarded as the crowning object of all medical study, and this has constantly been kept in view. Both the student and practitioner feel the want of full and specific accounts of the *treatment* of diseases in their earlier as well as in their later stages, in their milder as well as in their graver forms, and an attempt has been made to supply that want.

In many different diseases similar pathological and therapeutical principles are concerned, and the same remedies are required, though with modifications in their applications. All must be presented in connection with each affection, and repetitions will therefore be found which may appear redundant. But fulness and explicitness in the account of each disease, particularly of its treatment, are too important to the student and young practitioner to be sacrificed to mere brevity or literary taste.

In the treatment of the various subjects, reasons for the conclusions arrived at have usually been given, and principles have been held in view and expressed, as well as details specified; and an effort has been made to produce a work that should be more than a synopsis which would foster superficiality, but less than an extended treatise which might exhaust the patience of the reader and obscure the more important matters. The aim has been to present what was essential to a proper understanding of each subject, without entering into historical details, or dwelling upon doubtful facts, or upon theories not established. In short, a *practical* work has been attempted for students and physicians, which should avoid the extremes of superficial brevity and elaborate profuseness. How far these and other aims have been accomplished the readers will judge.

In conclusion I may be permitted to add, that my grateful acknowledgments cannot justly be withheld from one whose interest in all that concerns me is deepest, who has encouraged and sustained me by her sympathy throughout the preparation of this work, and whose unstinted and efficient labor in superintending the copying of the manuscript for the press, and in the revision of the proof-sheets has rendered possible the accomplishment of this task in the time that has been given it.

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PATHOLOGY

AND

PRACTICE OF MEDICINE.

GENERAL PATHOLOGY AND THERAPEUTICS.

DEFINITIONS AND GENERAL OBSERVATIONS ON THE NATURE OF DISEASE.

MEDICINE, in its broadest signification, embraces all the subjects having reference to health and disease.

It includes Anatomy, Physiology, Chemistry, Materia Medica, Pathology, Hygiene, and Therapeutics.

The present treatise will be especially devoted to that portion of Pathology, Hygiene, and Therapeutics belonging to human diseases, exclusive of surgical affections and those peculiar to women and children.

Pathology is defined as the science of disease. It embraces a knowledge of the nature, causes, phenomena, and results of morbid conditions.

Hygiene, in its widest sense, includes a particular knowledge of the causes of diseases, of the means of avoiding them, and of the rules for the preservation of health and a natural life. In this wider sense it includes Ætiology and Prophylactics. Ætiology is the study of the causes of disease, and Prophylactics, of those special measures necessary to prevent the occurrence of particularly threatened affections; while Hygiene, in its more restricted sense, teaches the modes of living applicable to the healthy condition, and for the purpose of its preservation.

Therapeutics is that part of medicine which treats of the application of remedies to the removal or melioration of diseases, and the relief of suffering from morbid states.

The following scheme presents in compact form the general science and art of medicine :

Pertaining to Health are	Anatomy. Physiology. Hygiene.	
Pertaining to Disease are	Pathology.	Diagnosis. Prognosis.
	Therapeutics.	Dietetics. Pharmaceutics. Surgery or Manipulations.
Between Health and Disease are		Ætiology. Prophylactics.

Pathology, which comes first in the logical order of the subjects pertaining to disease, is divided into general and special—General Pathology treating of those facts and principles relating to the production, the nature, and the character of diseases in general; while Special Pathology describes the causes, phenomena, and results of particular affections.

There are many facts and principles bearing upon the subject of the *nature* of disease, aside from the special phenomena of morbid action, some of which it will be important here to consider.

The world of which we take cognizance as a subject of science consists of Matter and Force.

By *Matter* is understood that which has material substance and form, which occupies space, and is subject to mechanical and chemical laws; and by *Force* that which acts upon or within matter, holding its parts in certain relations to each other, or inducing motion or change.

Matter is found in two conditions—dead and living. Dead matter is that which is subject to mechanical and chemical forces and laws only; while living matter is subject to additional forces and laws, which are called Vital.

Whether the vital forces and laws are essentially, and in their nature, different and distinct from the mechanical, or physical, and chemical forces, or whether they are only modifications or correlations of one general force, it will be unnecessary here to inquire: but it is certain that the vital force is different in its phenomena, in its manifestations and laws, from the mechanical and chemical forces, and requires a distinct recognition and consideration.

A distinctive feature of most living matter, or that which has been living, is its peculiar structure and organic form. The more characteristic living bodies, at least, are organisms—different parts having different structures and actions—the bodies having organs for the performance of particular functions.

Simple non-living bodies are homogeneous. In a metal or a definitely composed stone, one part is like every other part, having the same structure, relations, and susceptibilities; while in living organic bodies, the structure, the relations, and the susceptibilities of different parts differ, often widely.

Thus in man, whose conditions, especially in relation to his abnormalities and sufferings, it is the object of this work to consider, there is a large number of particular parts and organs of various structures and forms, each performing a more or less distinctive office in the general economy of the body. There are, for example, bones, which give firmness and protection; muscles, which are the instruments of motion; a stomach, which digests, and all these parts are bound together, in intimate relations, into a single complex organism.

Simple Protoplasm, the physical basis of life, the lowest form of living matter, has been thought by some to be homogeneous; but this is denied by others—a reticulated structure, it is alleged, having been seen in amœba, and in other of the simplest forms of living substance; and certainly in all the living bodies best known, particular forms and structures are present.

In the substance of all living organisms, from the amœba to man, the common properties of matter, mechanical, or physical, and chemical exist, and that substance is subject to its own appropriate mechanical and physical laws; but in addition, *the life-principle* is present, modifying the physical and chemical conditions and actions; and this is of so distinctive and important a character as to demand the most careful study.

The essential nature of this life-principle we may never be able fully to understand, but a knowledge of its leading properties and effects lies at the foundation of medical science.

As expressing our present knowledge respecting it, Life may be defined a certain relation or combination of matter and force, in which occur peculiar phenomena:

Those essential to all forms of life are
1. Motion from inherent power.
2. Nutrition—capability of appropriating nourishing materials.
3. Reproduction—the power of continuing the species.

Those necessary for the higher forms are
4. Differentiation of structure.
5. Organization.
6. Development.

Those phenomena belonging to the highest forms of life are
- 7. Sensibility.
- 8. Intelligence.
- 9. Will, or free determination.

The science of life in general, as manifested in all forms of living beings, is called Biology; and its study in the lower forms, and at its beginnings in higher organisms, often throws important light upon its conditions in developed human beings; and therefore the general doctrines of biology are important to be understood. There are, however, peculiarities in the human system which do not belong to other organisms, and the study of medicine is particularly the study of man. To obtain a knowledge of *life* as presenting itself in him is the special object of the student of medicine.

Medicine may be considered as both a *science* and an *art*. A science ascertains and expresses in an orderly manner facts and principles; an art applies them. A science is something to be known systematically; an art is something to be done skillfully; and medicine, as a subject to be mastered, considered in reference to its sources and its attainment, is the personal knowledge and experience of many, methodically arranged and recorded or expressed, so as to become attainable by others.

The Science of Medicine is the arranged and organized knowledge of all the circumstances relating to the health of man, in whatever climate or of whatever race; and the Art of Medicine is the application of the science to the prevention of abnormal and unfavorable conditions in man in respect to health, and to their removal or relief by any means which may influence the various bodily functions or mental operations.

Although a work on the Principles and Practice of Medicine is supposed to be occupied with an account of morbid conditions, their causes and their remedies, and though a knowledge of the system in its natural and proper conditions is supposed to be in possession of the reader, yet as this normal condition is so central a fact in medical science,—is the necessary standard of comparison by which the morbid conditions are made manifest,—some account of that standard, and frequent references to it, will be necessary in an elementary work of this character.

That part of the general science of medicine which treats of the normal activities of the system, its proper molecular and grosser motions, its growth and development, and of its functions, such as secretion, respiration, perception, etc., is called Physiology, and the natural condition is called the *Physiological State*.

Pathology treats of the morbid conditions and actions of the system; of the origin, nature, causes, course, and consequences of such actions; and the system, under any such injurious conditions and actions, is said to be in a *Pathological State.*

Life actions, of whatever kind, require certain conditions to be present, without which they cannot occur. There must be Heat, for without it all would be locked in the rigidity of death. There must be Air, as its oxygen is the universal pabulum of living beings. There must be Food to furnish materials, or growth and the repair of waste could not be carried on. There must be Water to facilitate motion, or the wheels of life would stop. Electricity and Light also furnish important conditions of certain vital activities.

Under the idea of life's being a principle needing something to excite it into action, these agents—heat, air, food, water, electricity, and light—have been called the *vital stimuli;* but the phrase, "*conditions of life,*" involving no theory, and stating simply what is known to be true, is the preferable expression.

When these conditions of life are all present in proper proportions, and all unfavorable materials and influences affecting the individual or his ancestors are excluded, the normal functions are performed, the system is developed and sustained after its type, and comfort, enjoyment, efficiency, and *health* result.

Perfect health, then, is the natural enjoyable condition of a normal organism in proper action.

In considering the relations of health and disease, we obtain more clear conceptions of their nature by contrasting an ideal state of perfect health with that of positive and unequivocal disease; but such an ideal state is not always present where we recognize the condition of health. As the term is commonly used, it is relative, and does not imply a fixed and definite state, or the performance in a perfect manner of all the functions of the body; and disease must therefore be equally indefinite, not separated from health by a well-defined boundary. All disease is abnormality, but all abnormality is not disease. The albino, deprived of the usual coloring matter of the system, and the individual who has lost a limb, are abnormal, but not necessarily diseased. The term disease usually implies morbid *action,* producing suffering or danger; while its opposite, health, implies freedom from such positive and decided morbid action, but not necessarily the most perfect state. Still the ideal distinctions are philosophical, and give more definite impressions of the nature of those conditions with which the practitioner has ordinarily to deal.

A defective organization in structure, power, or hereditary or acquired tendencies, defective (deficient or excessive) "life conditions," or the presence of directly injurious materials or agencies, result in modified abnormal actions and states; and when these are such as to cause discomfort, inefficiency, or danger, disease exists. In consequence of these relations of health and disease—of the physiological and pathological states—pathology has been called the physiology of disease, and has very properly been defined "the science of life under abnormal or morbid conditions."

Many definitions have been given of disease, more or less expressive of its nature; but from the foregoing statements it will be seen to be, *Perverted life-processes and their results—such changes in structure or function (or both) of the system or any of its parts as produce discomfort, inefficiency, or danger.*

With a distinct conception of what constitutes health, the simple expression, "a deviation from the healthy state," expresses correctly the idea of disease. So also with more fulness, as expressed by another: "Disease is any condition of the system or its parts, attended with impairment or derangement of structure or function, or both, tending to render life uneasy, burdensome, or useless, or to shorten its duration." As defined by still another: "Disease is some deviation from a state of health; a deviation consisting for the most part in an alteration in the functions, properties, or structures of some tissue or organ, owing to which its office in the economy is no longer performed in accordance with the normal standard."

It will be observed that in all these definitions, and those that are quoted are from writers who represent the best general sentiments of the profession, disease is represented as a *state of the system,* and not a thing of itself; as a condition, and not an entity; as phenomenal, and not ontological.

In the early stage of knowledge and among unenlightened people disease has been regarded as something having a distinct existence and an identity of its own, as something which possessed the body, as a spirit or a demon, or some other peculiar principle, to be driven out or destroyed by enchantments, by loud noises, by offensive odors, or by specific medicines; and these ideas, in vague and variously modified forms, linger as "relics of barbarism" in the popular, and even in some professional minds.

It is true, the *causes* of disease may be distinct entities—are often, as in infectious diseases, *materies morbi*—substances however minute or intangible, yet material substances, which enter the body and induce the changes constituting disease. But such primary causes are distinct from the effects they induce, and diseases are the modified actions and conditions produced by morbid causes, and cannot properly be conceived of as separate from the body in which they occur.

A disease, then, always implies a cause of some kind (very frequently other than a material substance), and certain changed phenomena produced by that cause. This is illustrated by such diseases as scabies, small-pox, and scarlatina, where, as is so demonstrable in scabies, a particular living material lodges in the body, and produces as results the specific phenomena. These phenomena constitute the disease, which does not include, though it implies, the cause.

Some writers have made the term disease embrace the cause as well as the effect of that cause. Thus Bristowe defines disease as a "complex of deleterious agency acting on the body, and of the phenomena (actual or potential) due to the operation of that agency." It is true that some morbid actions of the system, and results within it, often induce other morbid actions and results—an effect thus becoming a cause—and such *cause* is a part of the phenomena constituting the disease. But causes and effects are logically separable, and a primary cause of disease is so distinct from its effects, from the disease itself, as to render its incorporation into the definition inadmissible.

Indeed, the distinction between diseases and their extraneous causes is indicated by the fact, which should never be lost sight of, that diseased actions are effected by the same mechanism and the same forces that produce healthy actions, of which they are but modifications. Nothing can be truer or more clearly expressed than the statement of this same writer, that the "processes of disease, however widely they may seem to diverge from those of health, are merely modifications of them, and their types must be sought in the normal physiological processes by which the body is developed, grows, maintains itself, and finally dies."

There are various elements in particular diseases; some of the elements receive distinct recognition and names, and are the causes of other morbid elements; but a specific term, such as cancer, rheumatism, pneumonia, scarlatina, etc., indicates a series of phenomena exclusive of the cause setting them in action. The derangements of the human body may be compared to those of a piece of artificial mechanism, such as an engine or a watch; the difference being that the living human mechanism is much more complicated in its construction and its different operations, and is subject to various other laws than those of simple mechanics. When a watch is perfectly constructed, when the proper force is supplied and no impediment interferes, its work is properly performed. When that work is not thus accomplished, there is a cause in the imperfect state of the mechanism, in the failure of the force impelling it, or in the presence of some obstructing or deranging agency extraneous to itself. The "conditions" of its proper state and activity are imperfect or wanting, or some other influence of an injurious character is operating upon it.

When derangement of its actions thus occurs, it is the duty of the mechanic who attempts to set it right, first to know the proper structure and mechanism of the watch, the principles of mechanics that apply to it, and the conditions necessary for its proper movements; next to examine its present state, to inquire into its surroundings and the agencies that may have affected it, to see whether its wheels are in proper order or position, whether its spring has the proper elasticity and power, or whether any foreign substance is adhering to its pivots or wheels, or has fallen into any part of its machinery. When this is done and the difficulty is discovered, he should proceed according to the principles of mechanical science and art, and the dictates of common sense, in a rational, but in no theoretical, dogmatic, or specific way, using such instruments, regardless of theories, as with least injury to the watch will remove the obstruction or remedy the defect. It would be absurd to suppose that there was any one universal principle upon which the watch repairer could properly proceed to accomplish his work—certainly no exclusive principle of *similia similibus* would be applicable. In the same manner the physician who undertakes to remove or diminish the derangement of the human body must first understand the normal structure and functions of this much more complex organism and the evidences of its proper state. He must know not only the physical structure and the mechanical principles concerned in it, but the chemical ingredients of which it is composed, and the chemical reactions and changes so constantly going on within it, and the chemical laws that govern such actions. Not only this, but he must have such knowledge as is possible of the much more obscure and complex life-principle and actions which give it its most striking characteristics, for all these elements and laws—mechanical, chemical, and vital—are present and in operation in the body, and each element may be deranged, requiring a remedy of its kind.

With this knowledge prerequisite, he must proceed to examine, as far as he is able, each part, comparing it with the normal standard, to discover what is wrong physically, chemically, or vitally. He must inquire, in many cases at least, into the past history and present surroundings of his patient, into all the influences to which he has been subjected, in search of causes. He must know what is the natural history, the usual course of the particular wrong condition he discovers, whether it is slight, brief, or self-limited, or severe, protracted, or indefinite in duration. He must also know the power and dangers of all the agencies, whether mechanical, chemical, or vital, which may influence the morbid conditions and actions present. In short, he must become master of the facts in the case, and proceed on rational, but not on any fanciful theoretic principles, to place the system in the most favorable condition for the performance of its functions, and then apply such agencies as science and experience have shown to have the power of removing causes safely, modifying wrong actions beneficially, sustaining strength when needed, and soothing suffering and distress. These are among the fundamental ideas respecting Scientific and Rational Medicine; and when the true nature of disease is understood, and the true principles of the science and art are appreciated, the intelligent and honest student will be saved from the delusions and the practice of any of the radically false systems which may be presented. These are germinal truths, which, once well planted in the soil of a sincere and intelligent mind, will take root and grow, and, expanding into a more extended series of truths, will exclude errors and absurdities; for it is true in the world of scientific truth, as in that of business or of faith, to him that hath shall be given, and he shall have more abundantly; while from him that hath not shall be taken even that he hath.

In the management of cases it should ever be borne in mind that a sick *person* is to be treated, and not merely a disease is to be combated. Disregarding the effects of the remedies aside from their influence on the diseased action, and overlooking the power of endurance of their effects by the system, while the disease, as something to be opposed and overcome is attacked, might result in the subduing of the disease and the patient too. The susceptible female or the feeble child must be managed with great delicacy; and indeed all patients should be managed, though without undue timidity, yet with great care. While care should be taken to avoid injury, conserve power, and give the forces of the system an opportunity to do what they are able to do safely and well; while, as is so often said, "we must aid nature and give her a chance;" and although morbid processes sometimes remove morbid causes, and in such cases should not be opposed, yet morbid processes have often to be interfered with, especially when their causes cannot be reached, and in many cases require to be directly modified or suppressed. For example, the increased heat may tend to remove the cause of a fever—may be an effort of the system to resist the shock of the morbid impression—yet the high temperature itself is a positive evil, and, when rising beyond a certain point, is of such great and imminent danger as to call most imperatively for its abatement. So, in other cases, symptoms having the effect to remove the causes, as in vomiting and diarrhœa in cases of irritating materials in the alimentary canal, may yet go to such an extent as to do great mischief, and require suppression.

If Nature was altogether wise and sufficient in all her efforts at remedying evils, there would be no need of the aid of art, and physicians would be useless; but she is not always thus wise and efficient; and in all cases whether to allow nature, upon which we always depend for ultimately establishing healthy action, to take its unaided and full course, or whether to interfere with positive agencies controlling activities and results, the intelligence and judgment of the physician must determine.

From all these definitions and statements respecting the nature of disease (and they have been made so fully because of the great importance of having accurate conceptions of these elementary facts and principles), it will be clearly seen that diseases are entirely phenomenal, are conditions and actions physical, chemical, or vital, existing in and performed by the natural organs and forces of the system, but changed from their normal and healthy state by unfavorable conditions or agencies. It will be further seen that in properly exercising his functions as a healer of men, the physician must have scientific knowledge as a foundation, must know the nature and condition of both the healthy and morbid states of the system with which he has to deal, and must proceed on scientific and common-sense principles, without exclusive dogmas based on fanciful theories, availing himself of the light of all reliable experience in selecting such remedies as will tend to correct what is wrong and will do as little injury as possible, either immediate or remote, to the patient confided to his care and judgment.

The whole range of the sciences, the observation of nature, the contemplation of analogies, the studying of various authors, learning from the experience of others as well as from that of his own, the recognition of differences of constitution, of the influence of locality and season—in short, all knowledge and all observation, so far as the capabilities of the mind will go, should be made available in coming to correct conclusions and in exercising the highest skill.

These general observations cannot be better concluded than by quoting the advice of Lord Bacon (so applicable to students and practitioners of medicine), as translated and paraphrased by Sir Thomas Watson in his classical Lectures on the Practice of Medicine: "Be not like the empiric ant, who collects from every side indiscriminately for present wants; nor speculative like the spider, who, seeking no materials abroad, spins his web of sophistry from the recesses of his being; but imitate rather the praiseworthy bee, who, gathering crude honey from various flowers, stores it up within, and, by his own operation, matures and perfects it for future use."

PHYSIOLOGICAL AND PATHOLOGICAL OBSERVATIONS.

Before proceeding to consider those primary changes constituting the elements of disease, a more particular reference to some facts in physiology, the basis of pathology, will facilitate an understanding of our subject.

Life, as we have already seen, comprises the formation and maintenance of the tissues and organs, and the exhibitions of their various functions.

The term Nutrition is applied to all those particular processes by which the body, from its earliest beginnings until the completion of the circle of its existence, is nourished, developed, and maintained. It consists in the continuous supply of new materials, in the elaboration of them, in their separation from the blood and their appropriation by the tissues ; and it also comprises the carrying away from the tissues and eliminating from the system the products of waste.

Function is the performance of the special *rôle* of a part—the execution of the purpose it serves in the economy, as distinct from the growth, development, and maintenance of its structure. The function of a muscle is its action in producing motion ; that of the heart and vessels in circulating the blood ; that of a gland in elaborating and separating a material subserving some useful end ; that of the brain in producing thought and purpose, etc.

The performance of the function of an organ, of whatever kind, though not an act of the nutritive process in the organ, is entirely dependent upon nutrition : and the character of the function is dependent upon the character of the nutrition.

Unless the blood, so important an agent of nutrition, finds its way to the organ, unless nutrient materials are furnished and appropriated, whether that function be motion, secretion, or intellection, it inevitably ceases ; and when nutrition is imperfectly performed the function is impaired. The nervous system exerts an important influence over nutrition in all the higher animals, and its irregular action often results in deranged nutrition and imperfect function.

When nutrition and function are normal, there is health ; when materially perverted, there is disease : and as the perversion of function depends chiefly, if not entirely, upon that of nutrition, disease for the most part, and certainly so far as structural changes are concerned, is perverted nutrition.

There are several conditions necessary to healthy nutrition. As enumerated by Paget, there must be : 1. A proper and not far distant supply of blood. 2. A proper composition and state of the blood. 3. A proper nervous influence. 4. A proper condition of the part to be nourished.

In closely studying these conditions, it is found that the last is of primary importance. Nutrition is chiefly dependent upon, and performed in and by, the solid tissues; and although the supply of blood is absolutely essential, its condition and supply depend chiefly upon the action of the solids, and the blood is secondary in the process. The solid tissues which are being nourished, select, abstract, appropriate, and elaborate the materials which are supplied to them by the blood, and upon their vital endowments the existence and character of the process immediately depend. From this view, the origin and characters of the tissues are seen to be subjects requiring careful study.

Since the times of Remak and others, who have studied the minute and most ultimate structures by means of the microscope and other improved methods of modern science, a viscid, colorless, albuminous, and apparently homogeneous matter, insoluble in water and coagulating when deprived of life, has been regarded as the first origin of every living thing. This material has received the name of protoplasm or bioplasm, or, as occurring in the animal body, animal sarcode. This substance is contractile, has the power of motion within itself; appropriates nourishing materials; is germinal—capable of multiplication and developmental changes; and in a quiescent state assumes rounded or oval forms of small microscopic size, which have usually a degree of organization, and are called *cells.* This bioplasm, as its name indicates, is regarded as the material of life; and the cell composed of it is spoken of as the "unit of life." When the cell is fully formed, it is described as consisting of an outer covering or investing membrane, inclosing more soft or semi-fluid contents, in which is usually embedded one or more small points of more solid material, called nuclei, and sometimes in each of these still other points, called nucleoli.

The outer covering, or cell wall, is called by Beale "formed matter;" is less active or vital than the contents—especially than the nuclei, which latter appear to possess the highest vitality. But neither the outer wall nor the nuclei are now considered essential to the cell as a life element, the rounded particle of molecular protoplasm being regarded as sufficient to constitute this "unit of life."

The nucleated cell, however, is regarded as the typical life form, though simple protoplasm is the essential basis material of which it is constituted. These cells have different degrees of vitality, according to their age and other circumstances, and assume different shapes as they exist in tissues; and many are differentiated or developed into the material of the various organs of the body. But in the tissue of the organs more or less of these cells remain in some of their cell-forms, constituting the most vital and active part of the tissues. Every organized part is either cellular or composed of forms derived from cells; and it is a cardinal principle, insisted upon so vehemently by Virchow and others, that cells originate from pre-existing cells, or at least from living germinal matter; and it is generally admitted that under no circumstances, so far as has been proved, do they originate *de novo*, or from matter of another form and not living.

These bioplastic molecules in the form of cells being the ultimate, if not exclusive, morphological elements capable of exhibiting manifestations of life, in a complex organism the phenomena of life are the result of the continued activity of innumerable molecular masses or cells. Many of these cells possess peculiar functions, but the separate cells are united, some by contact and others by influence, and their combined action results in various functions. All of the ultimate processes of life, healthy and morbid, have been considered as consisting of molecular motion, more distinctly manifested in the nucleated cell. This cell, especially in its early and embryonic state, is endowed with remarkable power. Under favorable circumstances of warmth, moisture, air, materials for food, etc., it throws out processes and otherwise alters its form; it absorbs solid particles and thus increases its protoplasm; it moves from place to place; it discharges effete matter from itself, and thus grows and is maintained; and it multiplies by methods of simple division, by gemmation or budding, and by endogenous development. As already stated, these cells are capable of differentiation, of changes of form and arrangement, of the production of fibres and other tissues, and ultimately organs and organisms, according to the impulses derived from their origin, or the type-force of the parent cells, tissues, or organisms. Each cell, then, has a life of its own, and, in an important sense, a separate and individual existence. It has its period of development, activity, and death. Though varied in its action by different influences by which it is surrounded, it has an independent action originating in itself. According to the doctrine of pangenesis each living molecule may reproduce itself; and each cell, as we have seen, has the power of reproduction, and, in accordance with a general law, it tends to reproduce after its kind. This is illustrated in the vegetable world by a minute portion of a leaf of the common begonia, which, when placed under favorable conditions, develops into an entire plant; and the common operation of skin-grafting illustrates the separate vitality and multiplication of animal cells. The production, development, and maintenance of a human body, through all its stages, is a series of generations, growth, and decay—generation and decay of molecules and cells, and growth, maintenance, and ultimate death of the body itself.

In the process of the sexual generation of man and other animals, the egg-cell of the maternal, and the sperm-cell of the paternal, parent, each having its own characteristics, meet and blend together; and the resultant vitalized cell partakes of the impulses and characteristics of both.

The peculiar life of this resultant cell is the product of the paternal activities transmitted through the sperm-cell, together with maternal activities transmitted through the egg. These primary cells become many, and the early embryo is composed of cells in a very active state of vitality. In the vertebrata these fertilized embryonic cells are arranged first into two, then into three, and ultimately, according to Remak, into four layers. The upper stratum of the primary layer is described as a serous, and the lower as a mucous, layer. The third or intermediate layer is produced by the division of the lower or mucous layer; and this third at a later period divides again. From these different embryonic cellular layers are produced different tissues and parts of the body.

From the upper serous layer proceed those cells which compose the outer skin (the epidermis) and its appendages—hair, nails, etc.,—and remarkable as it is, this layer also produces the cells which constitute the central nervous system, the brain and spinal marrow.

From the lower or mucous germ-layer are developed the cells which form the epithelium of the mucous or internal lining membrane of the alimentary canal, and that of the ducts of the glandular and other organs communicating with it, the lining of the ducts of the liver, lungs, salivary glands, etc., including all the tissues that take up the food and perform the work of digestion. From the middle germinal layer, situated between the serous and the mucous, and which ultimately subdivides, arise all the other tissues of the body—the vascular system, ductless glands, flesh, blood, bones, and ligaments, and the widely distributed connective tissue which is found in every organ and part of the system. The middle embryonic layer which produces all these tissues is called by Remak the "motor-generative" layer; and he found that in its subdivision the upper part of the cleavage formed the true skin, the muscles, and the bones, while the lower part produced the alimentary fibrous lamellæ, or serous membranes forming the outer covering of the alimentary canal, and also the heart, the blood-vessels, and other like parts having serous envelopes.

These details may seem not to belong to our subject; but pathology is based upon physiological details, and a knowledge of the diverse origins of different tissues and organs may afford suggestions or explanations respecting the spread of diseases to various parts, or the sympathetic connections which may be found to exist. The simple tissues are variously grouped into organs; and the different kinds of tissue are arranged by Virchow into epithelial, connective, and higher grades, as those of the parenchyma of organs. The functions of organs having similar tissue origins are very various, but they may have other relations depending upon such origins not yet traced.

The connective tissue derived from the middle embryonic layer pervades all parts of the body, forming an extensive net-work, receiving and protecting the higher tissues, the elements of the organs. This connective tissue is largely composed of cells, often very small, commonly nucleated and walled, sometimes rounded and isolated, at others stellated with the processes joining other cells. Epithelial cells are in close contact, while connective-tissue cells are often separated by intervening substances, either lifeless deposits (calcareous, pigmentary, etc.) or higher living material, the peculiar tissues of special organs. There are several varieties of these connective-tissue cells, all being somewhat specially liable to pathological changes, and therefore of much interest in the study of disease.

As ordinarily found in fasciæ and tendons, the cells are comparatively scanty, are mingled with white and yellow elastic fibrous bands and with the mummified bodies of dead cells. In cartilages these cells are rounded or oval, an elastic homogeneous material intervening.

The lacunæ and canaliculi of bones mark the position of cells and their radiating processes, the proper earthy bone deposit being between. The central nervous organs and the lymphatic glands have what are called "retiform" connective-tissue cells, minute and stellate, the rays delicate, apparently homogeneous, inclosing exceedingly small spaces filled in the respective organs with proper brain and gland substances.

The mucous variety of connective-tissue cells is abundant in the fœtus, especially in the umbilical cord; but in adults it is found only in the vitreous humor of the eye, the spaces containing fluid and mucine. In dark tissues, such as the choroid coat and the spinal pia mater, connective-tissue cells contain pigment, and in various places they contain oil, constituting in these different cases pigment tissue and fat tissue. The functions of the various cells so abundant in the body, and particularly those of the cells of the connective tissue, have received great attention, particularly from Virchow and others of his school, who contend that upon the protoplastic particles and their stellate processes—upon these cells found in this net-work sustaining every element and organ of the body—the life actions, the growth and maintenance of the organism, immediately depend.

Each individual cell being a "unit of life," Virchow thinks, has a minute "cell district" over which it presides; and late observations seem to indicate that a nerve filament penetrates to the minutest part.

The mode of the composition of the various structures, from cells, differs in different cases.

Tubular tissues, nerves, nerve-cells, muscular fibres, capillary vessels, and all organs are produced by the juxtaposition and coalescence of protoplasm specialized into cells.

The composite organs, such as brain, glands, muscles, etc., are made up by association of the more elementary tissues developed from cells, with more or less of the cell forms still remaining, especially in the net-work of connective tissue distributed through them. The non-vital elements—chemical compounds, distributed in the interstices of the living elements—are prepared and deposited under the influence of living matter and the vital force, and are influenced in their changes and continuance in the parts by the living matter near them.

The doctrine now held, and which it has been the object of the foregoing statements to express, may be summarized by saying: That the living matter which carries on the life functions is in the form of cells, generally nucleated, and chiefly in those which are so universally distributed in the net-work of the connective tissue; but life functions are also performed by the free corpuscles in the circulating fluids, blood and lymph, which have the characters of cells, and have a similar vitality to that of other cells.

Accordingly, in a complex organism, the phenomena of life are the results of the continued activity of innumerable molecules, or of living protoplasmic particles, usually in the form of cells; different cells possessing peculiar functions, but all more or less intimately united in sympathy and influence; and being all supplied by the same blood, and under the control of the one nervous system, act in harmony, and result in the various functions of the body.

It follows from this, that in the cells is the seat of nutrition, that their normal actions result in healthy nutrition, and their abnormal actions in morbid nutrition; and disease being perverted life actions, and for the most part perverted nutrition, the immediate seat of disease is in the cells, and is thought to be chiefly in the cells of the connective tissue. In the cells of the tissues all morbid structural changes occur, as well as all healthy nutritive processes; but morbid changes in the cells of the blood also result in various perversions of function in different organs.

We thus come at the very citadel of disease, and from this point can better understand its nature, and may survey with more precision its outposts and approaches. It is at this point that the ultimate physiological actions take place, and pathological actions are but modifications of the physiological.

Though in the solids of the body healthy nutrition and its morbid changes constituting disease have their more particular seat, yet, as just stated, the fluids are essentially concerned in many of these processes; and in the blood and lymph we have cells composed of solid or semi-solid matter, with a full endowment of life properties, differing from cells in the solid tissues chiefly in their greater isolation from each other and their mobility, floating, as they do, in a circulating fluid.

For a full account of the structure, chemistry, and physiology of the blood, the reader is referred to the works on medical chemistry and on physiology; but some of the facts respecting this "fluid flesh," and "the life of all flesh," as it has been called, are so important in physiological and pathological processes, that they require a notice in this connection.

A nutritive fluid circulates through the tissues of all organized beings, and is essential to the carrying on of vital actions. In plants it is the sap; and in the higher organized animals it is blood and lymph. Both these fluids carry nutrient materials; and the blood, in addition, is the medium of distribution to all parts of the system of oxygen—the element so immediately essential to all life.

The blood has still another function. It receives into itself the results of the destructive metamorphosis of worn-out tissues, and carries them to the excreting organs for elimination. The lymphatic vessels sometimes carry other than nutrient materials—absorption of medicines and diseased products taking place through their coats and being conveyed through them to distant parts; but the full functions of the lymph and lymph vessels are less understood than those of the blood.

Some who take a very physical and chemical view of all life processes regard the development of all life force as the result of the oxidation and destruction of the tissues manifesting such force, as the simple result of force set free by the combination of oxygen with carbon and hydrogen, similarly to the movement of the steam-engine by the combustion of fuel; but whether this be the true view or not —and it is a matter certainly admitting of question—there is more or less wear and destruction constantly going on in active parts, and the effete material, the result of such destruction, requires constant removal, which the blood is a medium in effecting. Tissues are changing at all times, but more rapidly in violent action, while repair goes on perpetually, and its results, if not its activity, are more manifest when the body is in a state of comparative repose.

Wherever repair or growth takes place, the material of the productive action must be supplied, and food, of course, is essential. It is estimated that an ordinarily active man receives into his system some 3,000 pounds of matter, solid and liquid, in the course of a year, and in simple maintenance loses as much ; while in the growth and health of youth the supply is greater than the loss, and in the decay of age and disease the loss is greater than the supply.

The blood as circulating in the healthy system is an albuminous fluid, charged with salts, holding fibrine in solution, and containing colored and colorless corpuscles. Its specific gravity averages about 1.055, but varies from 1.050 to 1.059. In anæmia from hemorrhage or other causes, its specific gravity is much less; and in plethora, or after much sudden loss of its watery parts by profuse liquid discharges, as in cholera, its specific gravity is greater. Its temperature is about 100° F.—is higher in the right side of the heart than in the left, and is higher in the hepatic veins than in any other part of the body. Its reaction is constantly alkaline during life, but is sometimes acid after death, by the conversion of its sugar into lactic acid. Its quantity has been variously estimated ; but the heart, the arteries, and the veins of an adult man have not a capacity for more than about ten pounds, though an additional quantity may be in the system, contained in the minute capillaries and the tissues. The whole fluid portion of the blood, consisting of water, with salts, albumen, and fibrine in solution, is called the liquor sanguinis, or plasma. When the fibrine is coagulated and removed from the plasma, the remainder is called serum. The floating corpuscles in this liquor sanguinis are the more vitalized portions of the blood, and are of two kinds, white and red—the red flattened discs, the more numerous in the proportion of 370 or 400 to one of the white, average $\frac{1}{3500}$ of an inch in the largest diameter and much less in thickness, are generally said to be without nuclei, though some recent observers think they have seen them in some of the discs. The white corpuscles, or leucocytes, are globular in form, slightly granular upon the surface, average $\frac{1}{2500}$ of an inch in diameter, and are very similar in appearance to the corpuscles found in lymph and chyle, and to pus corpuscles. The leucocytes have nuclei, and some have regarded them as the more complete cells, and the lymph and chyle corpuscles as nuclei. These white-blood cells, or leucocytes, perform a very prominent part in certain processes of disease, as we shall hereafter have occasion to describe, passing with readiness through the coats of the vessels and mingling with the elements of the tissues; and it seems at least possible that in health they are capable of somewhat similar actions, and take some part in the supply of normal tissues.

Besides these well-known morphological constituents of the blood, the higher powers of the microscope show also minute molecules or granules floating in it, and, during digestion especially, small fatty particles.

There is an immense difference between the blood which enters and that which issues from the lungs. In the lungs it receives oxygen and loses its carbonic acid—is converted from venous into arterial blood; and the arterial blood is the supporter of life. Death follows the complete arrest of the circulation of arterial blood, and also the circulation of venous blood in the arteries, though carried by these vessels to the tissues. Arrest of circulation arrests nutrition, and the arrest of nutrition is death. The cessation of circulation is but a step from death, and that step is taken without delay.

The arrest of circulation may be due to the suspension of the action of the nervous system, leading to suspension of the heart's contractions, or to the arrest of the movement of respiration, as a constant nervous influence is necessary to keep these parts in action; or the morbid conditions suspending their actions may be in the heart and vessels, or in the lungs and respiratory passages themselves. The blood itself may be in so morbid a condition, or so deficient in quantity as to fail to sustain nutrition, when death is the result from that cause. A morbid condition of any of these parts, short of producing death, may cause such deficient or perverted action of the respiratory or circulatory system, or of the blood, as to lead to abnormal nutrition and the consequent phenomena of disease.

When removed from the vessels the blood coagulates, or forms a clot, by the fibrine previously held in solution becoming solid, taking the form of small thread-like fibres, arranged in different directions, and forming a net-work or felting, in the meshes or interstices of which the blood corpuscles are held, leaving more or less of the serum to separate from the mass. The causes of this coagulation are obscure, and none of the theories proposed to account for it are satisfactory. In certain diseased states the blood coagulates in the system, and may result in most serious consequences. It usually coagulates when passing out of the vessels into cavities or tissues, and sometimes clots form in the heart or vessels, and passing with the current of the blood to smaller branches, obstruct them, arresting circulation, nutrition, and function in the parts supplied by such vessels.

The conditions favoring such coagulation in the heart or vessels are: stagnation of the blood in them; disease of their walls; contact with other diseased structures; morbid products, as pus and sanies, mingling with the blood; obstructive disease of the heart; and great elevation of the temperature of the body.. Besides these, a diminished vital influence of the vessels and tissues, from diminished or perverted nervous supply, may tend to the same result.

The blood receives substances into itself from the air, from the food through the alimentary canal, and from the metamorphosis of tissues; the materials from the latter source to be carried out by the excreting organs. Various medicinal and poisonous agents find their way into the blood through the stomach, lungs, skin, or any membrane, or by being injected into the vessels or the tissues. In whatever way introduced into the fluid, they may affect its composition, thus indirectly affecting the solids; or these materials may be carried by the blood directly to solid tissues, impressing the nerves or modifying the action of cells, producing a great variety of unnatural impressions and morbid results. The zymotic diseases are produced by poisons, supposed to be germinal, taken into the blood, and probably into the lymph, affecting changes in the fluids and cells by some process resembling the action of ferments.

The operations of poisons taken in from without or generated within the system, harbored and carried by the blood, are among the most specific and frequent causes of the well-defined forms of disease. The view so clearly expressed by Sir James Paget, in his Surgical Pathology, that each single part of the body, in respect to the nutrient matter it receives and appropriates, stands to the whole body in the relation of an excretory substance, possesses a truth of some importance; as, if a part cease to receive the material prepared in the system for it, the blood may retain that material, and it may affect other parts abnormally, in a similar manner as when an excretion proper is retained. As an example, the phosphate of lime normally deposited from the blood in the bones is the same substance, with the same relations to the system, as that which is secreted from the kidneys and passes out with the urine. If retained in the blood and not deposited in the bones, where it should be, it might be deposited injuriously elsewhere, or it might do other mischief to the organism. So the failure of nutrition in any part may leave materials in the blood which may modify in different ways the actions and conditions of other parts of the body. Thus, through the blood and the nutrition, the different parts of the body are connected together, so that the state of one part has an influence on others.

The blood being so largely an agent of nutrition, its proper state, as we have seen, is necessary to healthy nutrition. In order that it may be in a proper state, there must be proper blood-making and proper blood-purifying processes. In order to the making of proper blood, there must be proper food, and·that food must be properly digested, absorbed, and elaborated. This proper digestion and elaboration requires the proper action of several organs—the stomach, liver, pancreas, etc.; and the proper purification of the blood requires the action of still other organs—the lungs, the kidneys, the skin, etc.; and in order that these organs may rightly perform their functions, they must in turn be properly nourished with healthy blood. This illustrates the mutual dependence of the different parts through the blood and the functions.

A more full account of the particular affections of the blood will be given in connection with descriptions of the diseases in which they occur; but a brief enumeration of the more common pathological changes to which it is liable, may be proper in connection with the subject of the immediate influence of the blood in producing pathological phenomena.

Following the arrangement of Dr. Flint, in his work on the Principles and Practice of Medicine, Diseases of the Blood may be considered under the following heads:

1. Changes in quality or quantity of its natural and essential constituents.
2. Accumulations in excess, of excrementitious substances.
3. The presence of foreign or abnormal substances developed in the body.
4. Foreign injurious substances introduced from without.
5. Other, but undetermined, blood changes.

Under the first head are the following changes, which will simply be named and defined: *a.* Plethora or Polyæmia—which consists in an abnormal quantity of the blood, and particularly of the red discs. *b.* Anæmia—the opposite condition to the last—consists in a deficiency of blood, and particularly of the red corpuscles. *c.* Spanæmia—which is an impoverishment of the blood—a lowered state in the richness and vitality of its ingredients. *d.* Necræmia—death of the blood or of some of its vital ingredients. *e.* Leucocythemia or leucæmia—an abnormal increase of the white corpuscles, and commonly a marked diminution of the red. *f.* Hyperinosis—morbid increase of the fibrine. *g.* Hypinosis—a diminution of the fibrine. *h.* Thrombosis and Embolism—an increased coagulability of the blood, inducing the formation of clots in the vessels. *i.* Hyperalbuminosis—excess of albumen. *j.* Hypalbuminosis—the opposite state or deficiency of albumen. *k.* Hydræmia—excess of water in the blood. *l.* Anhydræmia—diminution of the water. *m.* Lipæmia—excess of fat, fatty embolism. *n.* Anlipæmia—deficiency of fat. *o.* Mellinæmia or Glychæmia—excess of sugar. *p*. Excess or diminution of the salts of the blood.

Under the second head are found: *a*. Uræmia—an excess of urea. *b*. Uricæmia or Lithæmia—an excess of uric acid. *c*. Cholæmia—an excess of bile in the blood. *d*. Cholesteræmia—an excess of cholesterine. *e*. Excess of carbonic acid. *f*. Excess of perspiration matter. *g*. Fecal exuviæ absorbed into the blood from intestines.

Under the third head are: *a*. Pyæmia—pus in the blood. *b*. Septicæmia—septic or decomposing putrefying matter in the blood. *c*. Ichorrhæmia—ichorous matter or impure pus in the blood—all these three latter conditions being similar, and not easily distinguishable from each other. *d*. Oxalæmia—oxalate of lime in the blood. *e*. Ammoniæmia—ammonia in the blood. *f*. Melanæmia—black pigmentary substance in the blood. *g*. Acetonæmia—acetone in the blood. *h*. Zymotic viruses—poisons developed in the system and existing in the blood in various infectious and contagious diseases.

Under the fourth head are: *a*. Zymotic poisons, generated external to the human body, or within another, and taken into the blood from without, including viruses, contagiums, miasms, malaria, crowd-poisons, and venoms—the secretions of animals in their normal state. *b*. Various poisons, mineral and vegetable.

Under the last head, or that of undetermined blood affections, are doubtless many conditions, such as changes in the form, size, vitality and activity of the red discs and white corpuscles, disposing the one kind to adhere together, and the other to migrate freely from the vessels, and both to act abnormally in various ways.

But not only are the cells of the solid tissues, and the fluids, the blood and lymph, immediately concerned in nutrition, healthy and morbid, but the nervous system, as already repeatedly indicated, is also an essential agent. In all the higher animals the brain and nerves exert a direct influence over the cells of the tissues, which we have seen are the more immediate seat of the different changes of health and disease; but the brain and nerves control the action of the heart, and through the vaso-nervous system, the arteries, capillaries, and veins—all the vessels that supply the blood. The nervous system also controls the action of the lungs, the kidneys, and all the other organs that purify this fluid; and the functions of the stomach, the liver, and other organs which are concerned in forming it.

The nervous system and its various actions must be taken into the account when attempts are made to explain the manner in which disease is produced. Indeed, in diseased action, this system is often the first to suffer the impression of the morbid cause, and in the progress of diseases it is through it that many of the most dangerous phenomena are induced.

Not only the organic nerves specially controlling circulation, calorification, secretion, etc.—both the exciting and inhibitory—but the parts of the brain the seat of sensation, thought, emotion and will, and the nerves concerned in sensation and voluntary action, exert an influence directly or indirectly upon those changes constituting disease. The method of this influence may not be understood, but the fact of its existence and great power cannot be questioned. The most recent investigations indicate that nervous filaments are distributed to the minutest parts, and reach certainly by their influence each minute cell. The nerve influence upon the tissues has lately had additional light thrown upon it by the experimental observations of Dr. Brown-Séquard. He has noted the power possessed by the central nervous system, under the influence of certain irritations, of arresting the nutrition in different tissues and organs. The maximum arrest of the interchange between the tissues and the blood is produced by an excitement, as a puncture, near the point of the calamus scriptorius, but it is also caused by stimulation of other parts of the cerebro-spinal centre, and even by irritation of the sensory nerves.

The medulla oblongata and spinal cord exert so much influence upon nutrition that it can be arrested by merely flexing the head suddenly upon the thorax. Two effects have been observed—the blood in the veins, previously dark, becomes almost immediately bright red; and the temperature of the animal falls.

Various tests were applied, rendering it certain that these effects and others upon the calibre of the vessels were produced by irritation of the medulla and spinal cord, showing the influence of the nerve centres upon the organic processes.

Vaso-motor action, or the influence of the nerves and other agencies over the action of blood-vessels, over their dilatation and contraction, is of great importance, and has of late occupied much of the attention of physiologists and pathologists. That the nerves, particularly those designated as vaso-motor, have great influence upon the vessels there can be no doubt; but there are other agencies, as well, acting more directly upon the vessels and other contractile tissues.

It has very recently been found by Dr. W. H. Gaskell, that the nerveless apex of a frog's heart, separated from the rest, will perform its rhythmical contractions under the stimulus of electricity, and also under that of an increased pressure of the frog's own blood, and of an artificial blood solution, independent of the action of nerves.

It has been very lately ascertained that a dilute alkaline solution will excite contractions in an isolated and quiescent nerveless apex, and if the action of the alkali be continued, the muscle goes into a condition of tonic spasm, stopping in systole. On the contrary, an acid solution (lactic and acetic acids were used) produced relaxation of the heart, and it stopped in diastole. The actions of alkalies and acids were antagonistic, one overcoming the other, but neither of them was permanent in its effects, as an artificial blood solution would restore rhythmical action.

It was further ascertained that certain poisons, as antiarin (that of the upas-tree) and digitalin, act as do alkalies, causing increased tone irrespective of contractions; whereas muscarin and pilocarpin act like the acids, causing loss of tone. Atropine acts in the same manner as the alkalies. Not only the heart, but the muscles of the smaller arteries are affected in the same way by the alkalies and acids and the other agents, when nervous influence was apparently excluded.

These experiments have shown that, aside from the influence exerted through the nerves, local conditions—the nature of the fluid surrounding the muscular fibres—affect their condition. Tonicity is augmented by the increased alkalinity of the fluid, and diminished by its lessened alkalinity. The alkalinity of muscular fluids is modified by various conditions—by ingesta, by exercise, etc. The practical bearing and importance of these facts will be readily seen. Not only physiology and pathology, but therapeutics, may be greatly influenced by them. The nerves being sent from common centres in all directions, each part of the body is joined through their distribution to every other part, uniting all in sympathy, and producing a unity of organism and action out of a diversity of tissues and organs.

Morbid Actions strictly local in their beginning, as from a mechanical or chemical injury, extend to other parts and in various ways. They may extend: 1. By continuity and contiguity, by spreading on in the same structure by the contact of similar cells and tissues; and also by nearness of parts, though dissimilar, by some influence through the blood, nerves, or tissues found to be exerted by diseased structures over others in their neighborhood.

2. Diseased actions spread, as has already been intimated, by the blood and lymph carrying morbid materials from the diseased to other parts, and also by that relation of different parts through the blood and the nutritive process by which one part bears to others the relation of an excretory substance.

3. Disease in one part may extend to another by similarity of the structure and functions of the two. Similar parts engaged in the same work, supplied by similar vessels, and having the same relations to particular nutrient materials in the blood and lymph, are more liable to be affected in a similar manner.

4. Diseases extend by sympathy conveyed through the nervous system by reflex action, and probably by direct nervous communication, to parts distant and diverse from each other.

The manner in which disease of one organ may affect others through *dependence of function* has already been stated, and may be illustrated by examples. Disease of the stomach, by preventing the proper digestion of food, will produce weakness and derangement of the whole body; and disease of the kidneys, by interfering with the elimination of urea and causing its retention in the blood, will poison the whole system, causing a variety of morbid effects. But by sympathy proper, effects are produced in a different way.

Sympathy, as the term is here used, is such a relation of different parts through the blood and the nerves, that the conditions of the one, change the conditions of others without dependence of function.

The sympathy established through the blood and lymph has been sufficiently stated. That through the nervous system is more frequently and more strikingly manifested, and is a matter of much practical importance.

For more full details of reflex and general nervous action, the reader is referred, as in the case of the blood, to the works on physiology. It may, however, here be stated, that in the spinal cord particularly, but also in the brain and ganglionic nerves, there are reflex centres, to which impressions are carried by one set of nerves, and from which they are reflected back by another, producing sometimes sensation, sometimes motion, and sometimes modifications of nutrition and secretion, and resulting in various changes, physiological and pathological, in parts distant from the point where the first impression is made.

Reflex action of all kinds--motor, sensory, or nutritive—whether conveyed through the cerebro-spinal nerves or the ganglionic, is independent of will, and reflex muscular motion as well as organic effects may be induced in unconscious states. By tickling the foot of a sleeping child, an impression is conveyed to the spinal cord through an afferent nerve, and conveyed back through an efferent motor filament, and the foot is drawn away without the consciousness or act of will of the child.

This illustrates the principle of reflex action, and shows one method by which impressions upon one part affect others distant and diverse. But, as already stated, impressions may doubtless be conveyed directly through nerves from one part to another without being reflected from a centre. But whatever the method, the fact is evident that conditions of one part affect those of another through those nervous connections which aid in constituting the body a single entity.

Sympathy between two parts is said to be *direct* when the condition of one part induces a similar condition in another. It is *indirect sympathy* or *antagonism* when a particular condition of one part causes an opposite one in another. When an irritation or inflammation in one part, as of the uterus, causes a similar irritation or inflammation in another, as of the peritoneum, the sympathy is direct. On the other hand, when an irritation or inflammation, as from a blister, on one part, diminishes that condition in another, there is indirect sympathy or antagonism.

Sympathy, whether affecting sensory, motor, secretory, nutritive, or morphological changes, may be either physiological, pathological, or therapeutical. Some are entirely physiological, as where food taken into the mouth causes secretion of saliva; while others are pathological, as where an irritation of the uterus, as by the introduction of a tent, causes peritoneal inflammation; and others still are therapeutical, as when a blister over the epigastrium relieves, as it often does, an inflammation of the stomach. Sympathy is not equally active between all parts of the body. There are special sympathies between some parts more than are manifested between different portions of the system in general. Thus there are more intimate sympathies between some dual organs, as where one eye suffers from traumatic injury—the presence of a foreign body—the other is exceedingly liable to be affected. There are also some special sympathies between parts on the same side, as when a tooth is diseased and painful, the whole of the same side of the face suffers with it.

There are special sympathies between particular organs not dependent upon duality or locality. The uterus and the breasts, the stomach and the heart, the stomach and the liver, the stomach and the brain, especially sympathize with each other; and in children, particularly, there seems a marked sympathy between the irritated gums, in teething, and the intestines. There are also special sympathies between muscles habitually acting together; so much so that paralyzed muscles, entirely deprived of the control of the will, may nevertheless act in sympathy with other muscles with which they are specially in concert. In the act of yawning the arms are automatically elevated, and in that of sneezing the lower extremities are spasmodically contracted. During the act of yawning a paralyzed arm, motionless at other times from any impulse of the will, will sometimes be raised in sympathy with the general yawning movement, and a paralyzed leg will similarly be drawn up in sneezing. Sympathy has largely to do with automatic movements generally, as it has with vicarious actions, and with the metastasis of some diseases. It is indeed a principle constantly in action throughout the organism, accounting for many things that would otherwise be unaccountable. The stomach and pelvic organs of the female are two great centres of sympathetic actions. Many derangements of the stomach, though scarcely producing unpleasant sensations of that organ, are accompanied with pains in the head, the chest, and other parts of the body ; and morbid conditions of the uterus or ovaries, though unaccompanied by sensations in those parts sufficient to particularly attract attention, are productive of pains in the side, the back, under the breasts, in the head, and elsewhere, often of a severe character ; and other symptoms, and perversion of functions of organs, such as nausea, vomiting, spasm, emotional excitements, and changes of circulation, secretions, and nutrition, in various distant parts, are exceedingly common phenomena, and not to be overlooked in distinguishing and treating diseases.

Mental influences operate by sympathy in producing bodily effects. Impressions upon any part of the sensational and intellectual, but especially upon the emotional parts of the brain, are conveyed to other parts of the organ with more or less force, and reflected in a great variety of actions, healthy or morbid, according to the character of the original impression and the state of the brain. Indeed, as forcibly and recently shown by Dr. Brown-Séquard, the physiology and pathology of the brain, the location of its particular functions, and the variety of the effects produced by similar lesions, are not to be understood without taking into the account this principle of sympathy. Many facts shown by the observations of Charcot and others, and occurring in every-day experience, illustrate the truth and importance of this principle. Passions, thoughts, and acts of the will influence, sometimes markedly, organic functions, and become causes or remedies of morbid states. The influence of attention and confidence in modifying bodily actions of various kinds, is well known to the observant physician, and may be made available for therapeutical purposes.

An important fact in relation to this subject is, that in disease and weakness, in fatigue, and in certain conditions of half-sleep, when the will has less control, the sympathies of every kind are usually more active. The system then yielding more to sympathetic impressions, they exercise far greater control. The tickling of the nose in half-sleep produces much more reflex action than in the full waking state. This greater sympathetic impressibility occurs in some diseases and with some persons more than with others. In females and others called "nervous," and in many of the functional derangements of the nervous system, in a combination of dyspepsia, anæmia, and uterine derangements, morbid sympathies are often very strikingly manifested.

In disease the *inhibitory* or restraining nerves are often paralyzed or weakened, leading to certain increased, unrestrained, and irregular actions, readily mistaken for stimulation or the manifestation of real increase of power. The division or paralysis of the splanchnic nerve causes increased peristaltic motion of the intestines, and the same division or paralysis of the inhibitory nerve of the heart increases the frequency of its beat; but in neither of these cases has the real power of the organ been increased, only a restraining, governing influence has been removed; and like the removal of the pendulum from a clock, or the balance-wheel from a watch, the same, or even a less force would cause a more rapid motion of the machinery. Increased but exhausting activities in different directions often result from positive weakness, and increased sympathetic actions are generally evidences of exhaustion or debility.

The importance of these facts in understanding the action of various agents, medicinal or toxic, must be apparent. Overlooking them has given rise to serious errors in regard to the effects of alcohol, opium, and various other narcotic substances.

But not only does sympathy exist between different parts of an organism, but between different individual organisms also. It would lead too far from the present purpose to discuss this subject in all its aspects, but it has relations to Medicine, and requires a brief notice. Sympathy between different persons is a fact of common observation. The condition, particularly mental, of one person, affects that of others brought in communication and intimate relations. It embraces the principle of imitation, so marked a quality in many, and is much more strongly manifested in some persons than in others. One with a strong personal force, and with feelings readily responsive to the interests of others, often exerts a powerfully controlling influence over those within his sphere. In conditions of high excitement, especially where large numbers are concerned, these sympathetic influences are much more manifested; and like the imitative movements of gregarious animals following a leader, numbers rush in one direction or another, both in conclusions and actions, from feeling and impulse, rather than from reason and logical conviction. Illustrations in experience and history might be given indefinitely. In most great movements, political, social, or religious, sympathy is a more powerful agent than logic.

In some peculiar conditions of partial sleep, induced by monotonous movements, by expectant attention and the excitement of novelty and mystery, the control of one person over another becomes in some cases almost unlimited. Particular mental and bodily functions may be specially excited, while others are in abeyance, and various strange phenomena, mental and physical, may follow. All that is not deception and chicanery in mesmerism, witchcraft, and other occult mysteries, can be accounted for, when more is known of life and the functions of the nervous system, on natural principles; and much is now explicable by the exaltation and peculiar excitement of certain faculties chiefly through sympathy.

This principle of sympathy, though sometimes producing results that have disgraced humanity, as during the French Revolution, under the sympathetic influence of Robespierre and his associates, has great uses in the discipline of armies under strong and sympathetic generals; and in the great political, moral, and religious movements which revolutionize communities and nations. In a smaller but very beneficial way it enables the physician and the nurse, possessed of the proper qualities, to control by personal force many of the conditions of feeble, dependent, and confiding patients. The personal influence of the prescriber, and the attention and expectation of the patient must not be lost sight of in determining the value of more material therapeutic agents; and mental influences are too important to be disregarded in the management of the sick.

We have now taken a view of the ultimate bioplasm, the active tissue cells, the blood and lymph, and the nervous system, as more intimately concerned in the processes of life, normal and morbid. The *vessels* supplying the pabulum of the tissues, especially the capillaries, are quite intimately connected with these processes, and are early changed in their conditions and actions where disease occurs.

Different special organs of the body, consisting of an aggregation of more elementary parts performing peculiar functions, are necessary to the continuance of life and its processes, and their normal condition is necessary to the continuance of health. They are often early involved in diseases, and through their impaired functions or sympathetic influences many of the most distressing and dangerous phenomena of disease are produced.

The derangements of these organs and their influence in producing morbid phenomena, as well as the more remote and particular causes modifying the healthy processes and setting the morbid ones in action, will be more particularly described as we come to the consideration of particular diseases.

The order best adapted to our purpose in studying disease is: 1st. To inquire into its essential nature. 2d. To examine its more fundamental elements analytically. 3d. To study the combination of these elements in series of phenomena constituting particular diseases, synthetically. 4th. To study the evidences of disease and its particular forms, as presenting themselves in cases—first, theoretically, by descriptions, then by clinical observation and by *post-mortem* examinations—observing the grosser structural changes discoverable by the unaided senses, and then the minuter and more fundamental by means of the microscope and chemical reagents.

In the preceding pages we have been inquiring into the nature of diseased actions, and examining those constituents of the body and their changes most immediately concerned in them.

In examining the elementary constituents of disease we find : 1st. That certain changes of action occur—changes in the nutritive processes, and in other functions than those of nutrition. 2d. Changes of products—the production of modified and new materials. 3d. Changes of structure—tissue and morphological changes—changes in the composition and arrangement of particles, and in the consistence, size, form, number of organs, etc. When changes of action alone occur, or without perceptible change of composition and structure, the disease is said to be *functional.* Whether change of action takes place without some change of structure is questionable; but when no such change is perceptible by any of our means of investigation, the disease is called a functional affection.

The changes of products, as of secretions, or the new morbid matters produced, may be observed either by the unaided senses, by the microscope, or by chemical reagents. When reagents are used, the study comes under the head of Pathological Chemistry. Changes of structure in organs and parts are embraced in that part of pathology called **Morbid Anatomy.**

Those minuter changes of tissues perceived by the aid of the microscope come under a division of morbid anatomy called **Morbid Histology.**

The structural or functional changes alone or combined, the phenomena of disease occurring in the living body, perceptible to the physician or felt and described by the patient, and which may serve the purpose of determining the existence and character of such disease, are called **Symptoms.** They are the part of the phenomena of the disease apparent, given, or capable of being used for the discovery of the rest. The study of these phenomena is called **Semiology** or **Symptomatology**. Symptoms may be *general,* manifested in the system at large, or *local,* appearing in particular parts. Those directly observed by the physician are called *objective ;* those felt and described by the patient, *subjective.* The value of subjective symptoms will depend much upon the intelligence, the clearness of statement, and reliability of the patient.

The application of a knowledge of symptoms, and of the history and all the circumstances of the patient, to distinguish the existence of diseases and their special characters and varieties, is called **Diagnosis.** The science here becomes an art; and the first, and often most difficult part of the physician's duty in undertaking a case, is to make an accurate diagnosis. It often requires much knowledge, skill, and judgment—knowledge of the conditions normal to the patient, of the pathological changes that may occur, of the typical forms of special diseases and the varieties they may present, and of the true signification of the phenomena observed: and skill, in obtaining the history and observing the symptoms, and what are called physical signs; and often skill is required in the use of the microscope, stethoscope, and other clinical instruments, and in the use of chemical reagents: and judgment, a judicial discrimination in weighing evidence, excluding errors, and arriving at proper conclusions is always demanded.

The foretelling of the course and termination of a disease, or of its results, is called **Prognosis.** This is based upon a knowledge of the history of diseased action of a similar character to that of the case under consideration, of the effects of remedies in such cases, and upon an estimate of the strength of the system, or power of endurance of the patient. It is the principal popular test of a physician's knowledge and judgment. In doubtful cases, both for his own reputation and the interest of the patient, he must give his prognosis with care and reserve. An unfavorable opinion as to life should be expressed with great delicacy, if to the patient; but as a rule the opinion of a fatal result should be communicated to a relative of the patient or some judicious friend. As favorable an opinion as the case will justify should always be given, as the patient is entitled to the benefit of all the hope he may properly entertain. The practice, sometimes indulged in by unprincipled charlatans, of representing a disease worse than it is, with reference to a larger fee, or for the purpose of obtaining the credit of a great cure, is such a betrayal of the confidence, and such a sacrifice of the interests of the patient, as to render one guilty of it unworthy of the character of a physician, and deserving of the most intense execration.

Every disease, like every other event, has a cause—something producing it and necessary to its occurrence; and the study of the causes of disease is called **Ætiology.** This is a subject of the greatest importance, especially in reference to prevention, or *prophylaxis.*

Many distinctions of the causes of disease have been made; more, perhaps, than are logically required, but an enumeration of them may be suggestive of the character and variety of such causes. The following may be mentioned, contrasting those most distinguishable from each other.

They are predisposing and exciting; principal and accessory; proximate and remote; positive and negative; specific and non-specific; intrinsic and extrinsic; vital, mechanical, chemical, and toxic.

A predisposing cause is some condition or influence rendering the system more liable to a disease, while an exciting cause more immediately induces the result. A principal cause is the one most efficient, while an accessory one but aids its principal. A proximate cause is the one nearest the effect, and the term was formerly used to express what is now understood as the pathological condition inducing the symptoms. A remote cause is one acting at a greater distance in time or space—one not so immediately concerned in producing the result. The term, negative cause, indicates the privation of some material or condition necessary to health; while a positive cause is the presence of some injurious substance or agent. A specific cause is some peculiar material or influence producing a definite or specific form of disease, as the particular poison causing small-pox or ague; while a non-specific cause is one producing some morbid action, but not necessarily of a definite or specific character, such as improper food, exposure to cold, excessive fatigue, etc. An extrinsic cause is one operating from without the system, or part; an intrinsic one operating from within. A vital cause is one which influences the life-forces and actions, but which is not mechanical or chemical, such as impressions upon the mind, or effects on the nervous system independent of material substances. Some material substances, such as morphine and prussic acid, make an impression upon the activities of the system without, so far as ascertained, producing mechanical or chemical changes. They are therefore said to act on the life endowment, and are spoken of as *vital* causes of the changes they induce.

A mechanical cause is an injury by violence to structure; a chemical, an injury by chemical action either of the tissues or the fluids; and a toxic cause is some poison, mineral, vegetable, or animal, living or dead matter, producing injurious changes, usually of a serious character, independent of bulk, and some say of mechanical or even chemical properties. Chemical poisons are recognized, but such articles as morphia, strychnia, and prussic acid, which do not produce their effects by any marked chemical or mechanical actions, are regarded more particularly as poisons.

The special causes of disease coming under these various heads are very numerous. There are mental and physical causes—emotions, impressions; various parasites, microzymes, zymoses, contagions; climate, heredity, bad habits, sexual abuses, improper food and drinks, narcotics, heat, cold, moisture, *filth*, "epidemic constitutions of the air," age, sex, previous diseases, occupations, privations, etc. These will be more particularly mentioned in connection with the diseases they predispose to or excite. For a more detailed account of these causes the reader is referred to some of the many works on Hygiene or Preventive Medicine which are issuing from the press.

Elements of Disease.—While the special causes of disease are so numerous, the particular results—the different varieties of elementary morbid actions and products—are still more so; and as these elements may exist in any amount, and may have every degree of severity with an indefinite number of combinations, no two cases are in all respects exactly alike; yet the elementary products and processes admit of enumeration and distinctive description; and in individual cases series of phenomena occur having such resemblances as to admit of groupings for the convenience of study, and for the purpose of an imperfect classification and naming.

There are, as elementary products of morbid action, aqueous or liquid matters, as in dropsy; gaseous materials more rarely—pneumatoses; coagulable lymph; morbid cells from the cells of the tissues; leucocytes, cytoid corpuscles or pyoid cells; pus, mucus, effused blood; and albuminous, pigmentary, and fatty molecules. In the specific diseases are produced peculiar exudates and products, such as the lymph of the exanthems, the material of gonorrhœa and syphilis, of typhus and typhoid fever, the peculiar material of cancer, tubercle, and other morbid growths. Some of these materials are produced as living, multiplying germs or gemmules. There are more complex and organized substances produced by morbid processes, such as granulations and cicatrices. These may not be morbid in results, as they often produce repair of tissues, but the process of their production is not that of normal growth; and the production of a false membrane may be highly injurious in all its stages and consequences. There is often proliferation of connective tissue, and various morbid growths; and concretions of inorganic matter occasionally occur. Parasites may not only find their way into the body, but may multiply there, becoming the causes or product of abnormal conditions. The solid products of diseased actions have been divided into three classes: euplastic substances, such as cicatrices and false membrane; cacoplastic, as fibro-cartilage and gray tubercle; and aplastic, as atheroma, cheesy degenerations and concretions, or inorganic deposits. These and other particular materials and structural changes are the special subjects of works on Pathological Anatomy, Pathological Histology, and Pathological Chemistry. They will, however, be more fully described in connection with the diseases in which they occur.

Besides these elementary products, there are various *elementary complex processes*. Some of these are local, affecting particular parts, others are general, occurring in the system at large. Of the local conditions there are local irritation, hyperæmia, anæmia of particular parts, hemorrhage, hyperæsthesia, hypertrophy, dilatation, contraction, enlargement, atony, atrophy, degeneration, ulceration or necrobiosis, gangrene or necrosis, and the process of inflammation, which though chiefly local, yet involves the general system, and may be considered as between the local and general morbid processes.

Of the general complex elementary morbid processes there are general irritation, shock, fever or pyrexia (the febrile state), cachexia, depression, exhaustion, debility, and all the general functional derangements. These different elementary processes, states, and products, variously combined, result in certain series of phenomena, constituting the different diseases nosologically arranged and named.

Classification.—There are two possible kinds of classifications of diseases, which may be designated, the one as scientific or theoretical, and the other as empirical or practical. In the first, diseases would be considered as departures from the healthy state or physiological condition, and in the second, as approaching certain types of symptomatic phenomena.

Classification and naming, by all the methods yet adopted, are very defective; and more perfect and consistent methods must be left for the future and the more advanced state of the science. Classification and naming, as in other sciences, should be based upon the most essential conditions, and these are the pathological states; but some of them are so imperfectly understood, and the diseases have so long been known by names derived from certain of their symptoms or fancied conditions, or by names imposed arbitrarily, that changes are difficult and perfection as yet impossible. At present, custom and convenience, rather than scientific accuracy, must govern in the naming of disease.

Various groups of diseases have certain characteristics belonging to them in common, to which terms designating them are applied.

An epidemic disease is one prevailing over considerable regions and affecting many persons.

An endemic disease is one prevailing in, and belonging to, a particular locality.

A sporadic disease is one which is neither epidemic nor endemic, but occurs in isolated and occasional instances, and is usually not dependent upon any wide-spread or prevailing cause.

Zymotic diseases are those which are supposed to be produced by some peculiar poison, operating after the manner of a ferment. They are diseases affecting more or less the whole system, though commonly with some special local manifestations, and they are apt to prevail epidemically or endemically.

An infectious disease is one produced by some injurious agent, which infects or enters the system, producing somewhat specific morbid phenomena, such as cholera, yellow fever, etc. It is substantially the same as a zymotic disease, though not implying by its name the fermentation theory.

A contagious disease is one that is infectious, as it is produced by an infecting agent or poison, but this poison or contagium is always generated in the body of a person having the disease, and is communicated to another, producing the same affection, and such disease is usually produced in no other way.

The poison in an infectious disease may originate or be produced otherwise and elsewhere than in the body of a person affected with the disease, and may be multiplied exterior to the body. All contagious diseases are infectious, but all infectious diseases are not contagious. "Infection" is a broader term, including contagion, while "contagion" is more limited, embracing but a part of the infections, that part where the poison is produced in the bodies of the sick. Contact or even proximity of persons is by no means necessary to the communication of a contagion, as the poison may be carried often to great distances by fomites, substances to which the poison is attached, and otherwise; but the poison must by some means come in contact with or must enter the body, in order to the production of its effects. The means of communication may be by sensible application, by inoculation, by inhalation through the air, or by ingestion with food or drinks. It is sometimes said that mental or nervous conditions spread by contagion, but this is a figurative expression borrowed from the true type described, and must mean that the communication is by sympathy. There is confusion in the statements of some writers and in many minds on this subject of infection and contagion, and the two are often confounded.

The distinction ought not to be difficult, but can be made more clear by unequivocal examples.

Ague or malarial fever is an infectious disease, according to the proper signification of the term, as it is believed by all to be produced by a poison or infectious matter which enters the system and produces the specific phenomena. Small-pox is also an infectious disease, as it too is produced by a poison which enters the system and infects it. The ague or malarial poison is not generated in the body of a sick person, and is not communicated from one person to another; while the small-pox poison *is* generated in the body of one suffering from the disease, and is communicated to others, either by inoculation, through the air, by means of fomites, or otherwise.

The only possible question as to the correctness of this illustration is as to whether malarial fever should be called an infectious disease. If by an infectious disease is meant one which produces a poison communicable to others, then malarial fever is not infectious; but if by the term is meant a disease produced by a poison which enters the body and infects it, producing peculiar and specific phenomena, a use of the term sanctioned by the best writers, then it is an infectious disease. In this work the terms infection and infectious are used to mean poisons which enter the system and infect it, producing specific forms of disease, and include such a poison as malaria, and such a disease as malarious fever. The distinction of the things can but be made, whatever may be thought of the use of the words.

Yellow fever is called an infectious disease, but it is doubtful whether the poison is even multiplied in the bodies of the sick, and it is almost certain that it is not produced there exclusively or chiefly. If the poison is generated in the persons sick with the disease, and is communicated from them to others, it is contagious; if not, it is not contagious; but it is constantly spoken of as an infectious disease, and according to the meaning here given to the term, it is so. The sooner these terms are thus used and understood, the sooner will confusion and misunderstanding on this subject disappear.

A *Continued* disease, as a continued fever, is one whose symptoms do not disappear or remain in abeyance, but continue manifested until the disease has finished its course or ceases.

An *Intermitting* disease is one whose symptoms do disappear and again return, often at regular intervals. The term *Remitting* is applied when the symptoms very markedly abate at intervals, but do not entirely disappear while the disease continues its course.

A *Relapsing* disease is one which returns after more or less complete recovery.

The term *Congenital* is applied to diseases present at and from birth.

An *Hereditary* disease is one transmitted from parents.

An *Acquired* disease is one contracted after birth, and not inherited.

A *Malignant* disease is one of unusual severity and danger, or one which is persistent and usually incurable. Severe cases of cholera, yellow fever, and the different forms of cancer, are examples.

A *Specific* disease is usually dependent upon a peculiar poison, and naturally runs a somewhat definite and specific course.

A *Diathetic* disease is one which depends upon, or is accompanied by, some particular general morbid condition or tendency of the system, some special diathesis, as the strumous, arthritic, etc.

A *Primary* disease is the one first attacking the patient, where different diseases or different stages occur.

A *Secondary* disease is one following another, and is pathologically connected with it, or dependent upon it.

An *Intercurrent* affection is one that occurs while another is present, but without being connected with it as cause and effect.

A *Symptomatic* disease is a distinct, recognized pathological condition, which is a symptom of some other morbid state.

An *Idiopathic* disease is one which in its own phenomena constitutes the disease under which the patient labors. It is opposed to a symptomatic disease.

A *Sthenic* disease manifests in its phenomena much force of action —activity above the normal.

An *Asthenic* disease is the opposite of the last, is a disease of debility, or one manifesting little force.

The term *Constitutional,* as applied to a disease, indicates an affection of the system at large, and is often used synonymously with the term *general.* It is, however, also used to indicate a more serious, or at least a more permanent, change than would be conveyed by the word general. The words constitution and constitutional, as applied to the system, indicate a permanent state. Thus one with a good constitution has a vigorous life-force, and the different vital organs and functions are well formed and properly balanced. One with a feeble or bad constitution has a feeble life-force, or a defect or want of proper balance of the organs and functions. These conditions may be hereditary or congenital.

A broken constitution indicates a system which may have been originally good, but which has been permanently impaired by disease or accident, or by improper habits, or other bad life conditions. As an illustration of what is meant by a constitutional disease, the case of cancer or of syphilis may be mentioned. A cancerous growth, especially an epithelioma, may at first be local, but as it progresses it affects the whole system permanently, and becomes in the fullest sense of the word, constitutional. So with chancre. It is at first a local affection produced by a poison locally applied, but at length the whole system becomes affected, often permanently, and the syphilis is constitutional.

There are various conditions which modify the character of diseases, such as climate, locality, age, sex, habits, occupations, race, nationality, and personal peculiarities.

It has been thought that particular diseases were produced at an early period in the existence of the race from peculiar causes, and that their primitive characters have continued unchanged until the present time. Some diseases have doubtless retained a somewhat stereotyped character, but neither history nor analogy sustains the view of the fixed character of all diseases. The earth and all upon it have undergone great revolutions, as geology has shown, and doubtless each epoch since there are traces of man, has had its peculiar maladies, and in historic periods, even comparatively recent, changes in diseases have been observed. As pathological conditions are dependent upon physiological, and upon influences constantly variable, those pathological states must vary with the physiological, and with the influences causing them. The nervous system, cultivated in all directions and strained and hurried by an intenser life, has assumed almost new relations to the rest of the organism, and has disordered states unknown in the medical literature of the past. The use of tobacco and other agents that impress the nervous system, is producing peculiar morbid states. Groups of nervous affections cluster around the present intensified self-consciousness, constituting a large and growing proportion of the troubles of the present advanced life.

It seems to be true, as many hold, that there is a slowly deepening intolerance of alcohol, as well as an inability to bear depletion and other depressing agents, all tending to show that both physiological and pathological conditions are undergoing constant modifications; and new diseases may be expected in the future, as they have appeared in the past. By better hygienic conditions and wise preventive measures, it is to be hoped that many of the present diseases will pass away.

The modifications of diseases, and the production of different distinct morbid states by nationality, habits, associations, and localities, are too important to be lost sight of. For illustration, M. Charcot, when in London, desiring to illustrate the effect of certain agents upon a particular class of nervous and hysterical patients, was unable to find such patients, though inquiry was made in all the hospitals and of private practitioners, while such cases are readily gathered by scores in Paris. The climate, the locality, the customs, the hereditary influences, and all the surroundings of different European nations, produce peculiarities different from each other, and especially from those of our own country; and, even with us, the differences of north and south, of east and west, of city and country, and of particular localities and occupations, produce differences in diseases and the treatment required and borne, which a close observer will perceive, and a judicious practitioner will not ignore. While general principles are the same, even with men and animals, particular conditions differ among nations, classes, and individuals of our race; and certainly the treatment adapted to the hospital patients in the great cities of Europe may not be best adapted to private patients in the rural districts of America.

The works of foreign writers should not be followed implicitly by American physicians, nor should those produced by writers whose practice has been in large cities, in crowded hospitals, and as consultants, seeing diseases chiefly in their advanced stages, be strictly followed by the country practitioner who sees diseases under such different circumstances.

We come now to a more detailed description of those elementary morbid processes by which morbid materials are produced, and which, in connection with morbid products in varied combinations, constitute the different diseases.

IRRITABILITY AND IRRITATION.

Impressibility or excitability, the quality of receiving impressions and responding to them in actions, is a quality belonging to all organized living matter.

The term *irritability* is sometimes used as signifying this normal life-quality. It is here, however, used to indicate a degree of excitability something above the normal. There are widely different degrees of excitability, and the line of demarkation between the normal and the abnormal degree is not distinctly drawn. There are conditions of irritability, however, so much above the normal susceptibilities as to produce inconvenience and suffering, and therefore amounting to positive disease. Thus in practice, irritability of the stomach, the brain, the eyes, etc., is found to exist as a pathological condition requiring treatment.

Irritability, then, is morbid excitability, or a condition in which the ordinary agents impressing the system or part produce abnormal and injurious effects.

The excitability which is a necessary property of living matter has not only its degrees but its limits. It is subject to certain laws which may not be fully understood, but which it is the object of scientific research to reveal. Illustrations of some of the laws of excitability have been given by Dr. Burdon-Sanderson in his reported experiments upon the frog's heart. A portion of the ventricle separated from its connections has the power of responding to an impression, and retains that power for hours if placed under favorable conditions of a warm and moist atmosphere. When the ganglion which is a nerve-centre in the heart, giving it a degree of independent action, is intact in the portion of the ventricle experimented upon, a stimulant, as a prick with a needle, causes contractions which go on rhythmically for a length of time; but when the ganglion is removed, the muscular fibres contract under a stimulus, but rather slowly and progressively, the action commencing at the point touched, and the contraction is not repeated. It occurs but once from the same impression, and what is curious, it will not respond to another stimulating impression until it has completed the act commenced as the result of the first, and for some little time after. This necessity for rest might be regarded as the consequence of its exhaustion; but its refusal to act from another stimulating impression, while it is performing the contraction from the effect of the first, is called by Dr. S. its *obduracy*. Both terms indicate the limitation of the excitability of those fibres, and a certain law by which the action is governed. There seems a tendency to respond to but one stimulus at a time, and to the occurrence of a positive rest after one action. In this period of repose or suspended action, excitability accumulates or is recovered, and a response is then repeated. The existence of a law in the most elementary tissues, and in the simple acts, is indicative of a similar law or tendency in complex organisms and processes.

In accordance with this general law, or this tendency to respond to only one impression, one stimulant or irritant at the same time, a medicinal impression, when stronger than that of the cause of a disease, forced upon the organism, may, and sometimes does, supplant and arrest the action of the morbid cause. In other words, the medicinal impression may counteract and overcome the diseased action. This law or tendency goes far toward explaining the antagonism between certain articles, as between opium and belladonna, and also the antagonistic influence of certain remedies over particular diseases. The antipyretic effects of quinine, salicine, aconite, digitalis, and other articles, may find their explanation under this law.

Whether or not the human system or its parts as readily respond to more than one impression at the same time, it is certain there is a tendency to respond to some impressions but once. This is shown in the case of small-pox and other contagiums; and it is a matter of common observation that excitability becomes exhausted by responsive actions, and is restored by rest. Indeed, excitability accumulates by suspended action, so as often to become greater than normal, resulting in more or less violent reaction. The temporary diminution of action produced by the cold bath, is physiologically followed by increased circulation and a glow of warmth, and by increased activity of various functions ; and the feebleness of action from the shock of an injury, if that be not too profound, is followed by a feverish excitement.

Irritation is superexcitation with change of action, but without material change of structure. Increase of blood in the irritated part usually occurs as the only marked change perceptible, aside from changes of function. Irritation may be produced by a variety of causes. In a condition of morbid irritability the ordinary "vital stimuli" may excite it. Thus an irritable stomach will be excessively excited by ingesta, which in health would be physiological. So of the eye in regard to light, etc. An excess of the vital stimuli, or heterogeneous or abnormal stimulants, applied in a healthy condition, will cause irritation. Thus an excess of food, an excess of light, or an excess of heat, applied to however healthy a stomach, eye, or surface —or an irritant, mechanical, chemical, or vital, will produce the effect. Reflex impressions of various kinds also produce irritation.

The causes of irritation, then, may be morbid irritability, excesses of normal stimulants, the action of abnormal stimulants or irritants applied to the parts, or reflex impressions, physical or mental, from conditions of distant portions of the body.

Irritation, when intense or long continued, often results in other morbid changes, and then the processes take other names. In simple irritation the condition resembles increased physiological activity, shading off from it. As in such increased physiological action, so in irritation, the circulation is usually more active, the temperature is moderately elevated, molecular changes are increased, and in some cases cell-development is more rapid, while waste is also accelerated, and functional activity may, temporarily at least, be greater in amount, though it is generally abnormal in character. Like all other disease, it is modified physiological action, but the modification is less than in most other morbid states.

The deer's horn when growing, the uterus and mammary glands in pregnancy, the brain in active thought, the stomach during digestion, have conditions not easily distinguishable from the milder degrees of irritation : and this illustrates the intimate relations of health and disease. While irritation is so nearly connected with health on the one hand, it has the most intimate connections with more positive and serious disease on the other. An increase or continuance of the same causes which produce irritation may lead on to hyperplasia, to morbid growths, to degenerations, to great perversion of functions, and particularly to the complex process of inflammation.

The secondary effect of irritation is depression, or diminution of action; and its remote effects on other parts are various in accordance with the laws of sympathy and dependence of function. A simple irritation of one part may cause an inflammation in another, if that other part be more susceptible to the inflammatory process.

The frequent occurrence of irritation in other morbid states, and its intimate relation with them, and particularly with inflammation, which it precedes and of which it forms a part, will require further reference to it as we proceed. The beginning of many morbid processes consists of irritation, and its treatment is a very important part of therapeutics. Irritability, as a morbid state, may be either local, manifested in a particular organ or part, or general, affecting the system at large. Irritation may be either local or general also, but it is more frequently found and spoken of as local; and to its local conditions the preceding remarks more particularly apply.

Hyperæmia is an excessive quantity of blood in a part, and is an accompaniment of other morbid conditions, rather than a distinct disease of itself. It may be either active or passive. In active hyperæmia the current of the blood is more rapid, and the circulation increased, while in the passive form the motion is diminished, and the circulation sluggish or even in points suspended. Active hyperæmia is chiefly arterial, while passive is more venous; yet in either all the vessels, including the capillaries, usually contain an excess of blood.

Hyperæmia may depend upon various causes, remote and proximate. The immediate condition rendering it possible for more blood than normal to be in a part, is enlargement of the calibre of the vessels. Their distention may be produced by a larger quantity of blood being forced into them by increased action of the heart, and of the arteries leading to the part; by a greater attraction of the tissues for the blood; by obstruction of the return circulation through the veins; or by relaxation of the walls of the vessels, in consequence of their weakness or through modified action of the vaso-motor nerves. Irritation of nerves usually produces relaxation of vessels, though this relaxation may be preceded by contraction; and the division or paralysis of vaso-motor filaments also often results in such relaxation. Various causes, physical and mental, exciting and depressing influences, reflex impressions, etc., operating through the nervous system, modify the circulation, increasing or diminishing the quantity of blood in a part. The quantity of blood in the surface, particularly of the face, varies frequently and rapidly, especially in sensitive persons, by various emotions and impressions, as is witnessed in blushing and blanching; and doubtless changes of a similar character, from a variety of causes, occur in internal organs as well. Some of these are physiological, serving a useful purpose in modifying functional activity normally; others are pathological, changing functions morbidly.

Collateral or *compensatory* hyperæmia is where more blood is in one part in consequence of less being in another. When a given quantity of blood flows to an organ through the main vessel leading to it, an interruption of the flow through particular branches, from whatever cause, will produce an increased flow through other branches which are unobstructed, supplied by the same common trunk. The same principle applies to different organs of the body, as well as to different parts of the same organ. Thus when there is an interruption of the flow of blood to the lower part of the body, more will go to the upper part, and when there is less blood in superficial parts, there will be more internally.

Organs in the active performance of their functions usually have a larger quantity of blood; and it would seem most reasonable to suppose that this was effected by increased nervous stimulation of the vessels, and by their more active state. It is not easy to understand at first view how increased action of vessels, which must consist mostly in contraction, increases the quantity of blood in them, when, as is well known, a passive and relaxed condition produces that result. But a greater range of the rhythmical motion would have the effect of increasing the amount and circulation of the blood in the vessels; and this increased amount of expansion and contraction seems the most plausible explanation of the phenomena. While the vessels contract with more force, they are expanded more widely at each rhythmical act, and the result is increased blood and increased circulation in the part. Conditions of the blood itself, a disposition of the corpuscles to adhere together and to attach themselves to the walls of the vessels, may cause an accumulation, particularly of the corpuscles; and an increased attraction of the tissues for the blood may draw into the part and retain there an excess of fluid.

The phrase "determination of blood" is often used to signify active hyperæmia; while the term *congestion,* when used without qualification, and especially when applied to external diseases, generally signifies passive hyperæmia; but the phrase active congestion is also used, signifying active hyperæmia.

Like irritation, hyperæmia is intimately associated with other pathological processes—particularly with inflammation—often preceding and always accompanying it.

Hemorrhage is a flow of blood out of its vessels, whether arteries, veins, or capillaries, or whether from the surface, into cavities or into tissues. When such flow takes place, at least in any considerable quantity, there is rupture of vessels; and the essential condition producing it is a want of proportion between the blood pressure within the vessels and the resisting power of their walls. Interruption of the flow of blood through an artery will cause increased pressure in collateral branches, sometimes sufficient to cause hemorrhage; and indeed most of the causes producing hyperæmia may be so intense as to result in hemorrhage. Besides the increased blood-pressure, any degeneration or diseased process weakening or destroying the coats of the vessels, even without increased blood-pressure, may produce the same result. Infiltration of blood from small vessels, whether by their rupture or by the corpuscles passing through their pores into the interstices of tissues, is called hemorrhagic *infarction*; and a flow into tissues from larger vessels, causing solution of continuity and the presence of blood in an adventitious cavity, is called *apoplexy* of the part.

The passage of blood through the pores of vessels, without their rupture, is called *Diapedesis*, a phenomenon which modern observation proves to occasionally occur.

Dropsy is an effusion of serous or aqueous fluid into a cavity or into tissues. It takes different names as it is in different parts, and is a symptom of different pathological conditions, to be hereafter described.

Local Anæmia not unfrequently occurs, and may be caused by a tonic spasm of vessels; but is more frequently, in its severer forms, the result of obstruction of arteries leading to the part. The arteries may be obstructed by pressure from without, by morbid growths or deposits in their walls, or by clots of blood within them. The results will depend upon the extent of the obstruction, and when complete, death of the part will follow. In the less perfect obstructions, lowered vitality and impaired nutrition and functions are the conditions induced.

Degeneration consists in the substitution of matter lower in vitality and organization in place of the natural tissue, and is the result of diminished nutritive energy. A familiar example is in fatty degeneration of a muscle, where globules of fat take the place of the contractile fibres; and in proportion to its extent it destroys the character and power of the muscle. The substituted material is lower chemically, as well as physiologically, than the original tissue, and is the result as well as the cause of the loss of power.

There are various forms of degeneration besides fatty, as amyloid or lardaceous, pigmentary, earthy or calcareous, cheesy, colloid, mucoid, and atheromatous. When a general tendency to degeneration exists, it is usually an evidence of such failure of power as forebodes the most serious ultimate results, and is commonly progressive and persistent.

Atrophy is the diminution or wasting of a part, usually with corresponding loss of functional power. In the process of nutrition, as stated when on that subject, production and waste, growth and decay, generation and death, are constantly going on in the cells and the tissues. When the waste is greater than the production, atrophy results. The more remote causes are various, such as obstructed circulation, previous disease, injuries, etc. ; but the immediate condition is either diminished production or increased loss, or both of these together, of the elements of the tissues ; and like degeneration, it is an evidence of the loss of proper power in the parts concerned.

Gangrene or **Necrosis** is death in mass of some limited part of the body, and is the result of a complete arrest of nutrition in that part. It may be produced by various causes, such as a more complete obstruction of circulation, severe injury, or violent inflammation.

Ulceration or **Necrobiosis** is a process of molecular death, or death by small particles, without production in the part, resulting in tissue destruction and breach of surface. It is produced by causes similar to those of gangrene, but operating in a more limited manner.

A similar process, when occurring in bone tissue, is called **Caries.**

These latter conditions, though occurring in medical cases, are more common in surgical, and are treated of more fully in works on that subject.

The terms *Thrombosis* and *Embolism* indicate coagulation of blood within the heart or blood-vessels. When a coagulum forms during life, and remains at the point of its formation, it is called a thrombus. When it becomes detached and floats on in the current of blood, generally lodging at length in smaller vessels, it is called an embolus. When a coagulum adheres to the walls of a vessel which it does not fully obstruct, it is said to be *parietal;* when the obstruction is more complete, it is said to be *occluding.* Such coagulation may occur from changes in the walls of the vessels, or from retardation or arrest of the circulation of the blood, and it is favored by an increased quantity of fibrine and an increased tendency to its coagulation. Heart clots often form in the last stages of inflammation, when hyperinosis exists, and when the circulation becomes retarded from failure of the heart-power. When these occur slowly and some time before death, the red corpuscles are carried away in the current, and the fibrine remains, presenting the whitish or yellowish color and the greater firmness belonging to pure fibrine. Thrombi arising from retardation of the circulation are called *marantic;* those arising from wounds are called *traumatic;* and there are those from dilatation of vessels, as in aneurism, and from compression. Frequently a clot is formed from the combined influence of retardation of circulation and dilatation of vessels. The veins of the lower extremities in adults, and of the cerebral sinuses in children, are the most frequent seats of these thrombi.

A thrombus may remain for a long time with but little change, or it may organize or soften—organize by vessels extending into the attached fibrinous mass from the vasa vasorum, and by cells from the surface of the vessels, as in the case of the organization of false membranes elsewhere. The softening is effected by a breaking down in the central part into a grayish-red pulp, consisting of granular material with leucocytes, red blood corpuscles, and blood pigment, which was formerly mistaken for simple pus.

Some of these softened thrombi contain infectious matter, bacteria and decomposing substances, which, entering the circulation, induce the phenomena of septicæmia. Fragments of the thrombi are often detached, producing emboli, and both the thrombi and emboli are capable of producing severe mechanical effects and septic changes causing serious consequences. Infarctions in the lungs, liver, kidneys, spleen, brain, retina, and other parts, may result. The manner in which emboli produce infarctions has been differently explained by different pathologists. Cohnheim's view is that the capillaries of the obstructed district are filled with blood which has regurgitated through the veins, while Litten's experiments tend to show that the extravasated blood is from the adjoining small arteries and capillaries, when the pressure is sufficient to send the blood into them, but not sufficient to send it into the veins.

Hypertrophy is the opposite of atrophy, and consists in abnormal increase of normal, or at least nearly normal, tissue. Here the circulation is active, the production exceeds the waste, and it is an evidence of an abnormally active state of the nutritive process in the part, or possibly of an abnormal diminution of the process of waste, or a diminished removal of tissues which have served their ends. The increased size of the heart, when called upon for more labor to overcome some obstruction to the circulation, is a familiar example of hypertrophy proper. Here the power is increased with the size, and is compensative and useful. An enlarged spleen from malaria, or an enlarged uterus from certain irritations or displacements, are examples of what are generally called hypertrophies. But here the results of the increased nutrition are not entirely normal tissue, the functional power is perverted, and the whole process is injurious. The term

Hyperplasia in these latter cases is preferable to hypertrophy. Hyperplasia indicates abnormal increase of tissue, usually morbid. Hypertrophy should be restricted to mean the abnormal production of tissue, itself normal.

Hyperæmæsthesia is a term used by Dr. Hartshorne, indicative of a state of a part marked by the following conditions: 1. Enlarged vessels—increase in their calibre and in the thickness of their walls—and consequent protracted hyperæmia. 2. Increased sensibility and morbid susceptibility to various impressions (irritability). 3. Deficient or irregular functional power. 4. Proneness to attacks of acute or fully developed inflammation. 5. Often, though not always, hyperplasia. This condition approaches and often shades off into chronic inflammation, and by many is not distinguished from that state. All the ordinary conditions of fully developed inflammation are however not present, and the distinction seems one proper to be made.

Atony is a condition, sometimes local, of a particular part, and consists of a want of tone or firmness in contractile tissues. It is an evidence of weakness in the tissues, and is produced by causes similar to those which produce atrophy and degeneration. The nervous supply has perhaps more to do with this condition than with the others named.

Dilatations and **Contractions** occur, but are scarcely elementary conditions, and are secondary to other changes, and may be passed by without further consideration in this connection.

We have now described briefly the chief elementary local processes which occur as constituents of various diseases. Inflammation is usually considered as a local affection, but it so constantly involves the general system to a greater or less extent, and is so frequently dependent upon causes operating within or upon the body at large, that it may be considered both local and general, and will be discussed by itself, after some less important general conditions have been noticed.

It has already been intimated that irritability and irritation may be general as well as local; but the remarks applicable to the one will, in a general way, apply to the other, and respecting it little further need be said. General irritation bears a similar relation to fever that local irritation does to inflammation. It often precedes fever and is merged into its phenomena, and will be referred to in connection with that important morbid process.

Depression is an element of disease, and the term is usually applied to a condition of diminished action of the general system suddenly occurring, as from failure of nervous influence in shock, or in exhaustion from overaction, or from the direct effect of sedative agents. A diminished supply of blood to a part will cause local depression, as a loss of blood from the body and the other general causes will produce general depression.

Debility resembles depression, but is a more permanent diminution of action, arising from more permanent and slower acting causes, as from starvation or continued disease. It is an important condition, often requiring attention in treatment, but its importance and frequency as a cause and accompaniment of disease have been exaggerated. There are increased and modified, as well as diminished, actions in disease equally worthy of attention.

Shock is a depressing impression, usually violent in its cause and sudden in its occurrence. The depression produced by a mechanical injury, by a violent mental emotion, as of fear or sudden and great loss, or by the rapid onset and severe character of a local disease, is called by this name. It may be mitigated or prevented by agents diminishing sensibility or irritability, such as the narcotics or anæsthetics.

When a shock is not so violent as to completely overcome vital action, it is usually followed by reaction, by increased excitement, by irritation and fever. Shock and the response of the system in morbid action are of frequent occurrence, and are the cause of various diseased conditions, often requiring attention in treatment.

Collapse is a condition of extreme depression, often a result of shock, or is a state scarcely separable from it. The term, however, indicates a condition of more extreme or more permanent depression than that usually understood by shock. The symptoms are coldness and pallor, but sometimes, as in cholera, blueness of surface, particularly of the face and the extremities; perspiration, often profuse, is generally present; frequent, shallow, and sometimes labored or gasping respiration; feebleness of the heart's action, and often imperceptible pulse at the wrist; extreme muscular debility, though occasionally brief, forcible, but irregular muscular action; noises in the ears and indistinct vision; and often, though not always, confusion of thought. The temperature of the whole body sometimes falls several degrees below the normal, and it is usually soon followed by death.

The causes are similar to those of shock and depression, operating in a more extreme degree. The sudden abatement of a protracted and exhausting fever, or other forms of excitement, may be accompanied by collapse, but in other cases it is the result of profuse discharges, of the actions of poisons, or other extreme morbid conditions.

Syncope is a sudden failure of the heart's action, and differs from collapse mainly in this suddenness and in the completeness and more transitory character of such failure. Sometimes when complete consciousness is lost, and often when the patient is passing into this state, rigidity, or occasionally more decided spasms occur.

A more gradual failure of the heart's action, but not necessarily accompanied with coldness or collapse, is called **Asthenia.**

Emaciation is a general diminution or wasting of the flesh, and particularly of the adipose tissue of the body, and is produced by various diseases interfering with nutrition, or producing exhausting discharges, and by deficiency of food.

Obesity is a general and excessive accumulation of fat in the system, and may amount to a positive disease. It differs from fatty degeneration by the fat not taking the place of the normal tissues by substitution for them, but by being deposited in the interstices and connective tissue of parts. The favorite seat of its accumulation is in the external areolar tissue and in the omentum. It may be caused by excessive alimentation, and particularly by too free indulgence in carbonaceous foods; but it sometimes occurs in persons not addicted to any form of alimentary excess.

Fatty Infiltration sometimes occurs as a local condition, fat being deposited in particular organs, as in the liver or heart, and found in the interstices of the proper tissues, but not taking their place. The pressure of the accumulated fat may interfere with the nutrition of the proper tissues, causing waste, and is likely to interfere also with the performance of function. Fat is lower in chemical composition and organization than proper organ tissues, and its accumulation may be a result of arrested or incomplete assimilation of nutrient material.

Hyperæmia, as a strictly local condition, has already been noticed. Congestion was mentioned as a term nearly synonymous; but this latter term is often used in a more general sense, or as indicating a more extensive and severe affection than that usually indicated by the term hyperæmia.

Congestion is an accumulation of blood in the capillaries, the arteries, the veins, or the heart; and the term may be applied to accumulations of fluids in the lymphatic vessels. Such an accumulation may result in dilatation of vessels, in hemorrhage, in dropsical effusions, and other exudates; and when occurring in the heart, it may distend its cavities and arrest its actions. Congestion of the brain, or lungs, or other organs, may, when severe, arrest their functions, producing speedy death. From the suddenness with which serious results sometimes follow, the word has terrors to many minds, though it is generally a less serious form of disease than inflammation, producing far less anatomical and permanent changes, and is usually more readily removed.

The word **Diathesis** is used to indicate not so much a diseased condition as a tendency to some disease, and is commonly constitutional and permanent. We have the strumous, the tubercular, the arthritic, and neurotic diathesis, and others: that is, a tendency to the development of scrofula, consumption, rheumatism and gout, or nervous diseases, etc., respectively.

A **Cachexia** is a depraved condition of the system, the result of some constitutional disease, of some poison or other unfavorable condition a considerable time in operation, and which produces more or less permanent results. It is sometimes a diathesis developed, as the cancerous or strumous cachexia is the result of a fully formed cancerous or scrofulous disease. There are various cachexias from slowly acting but long-continued poisons, such as lead, arsenic, mercury, opium, alcohol, and tobacco. The lead and opium cachexias are not unfrequently observed, and the alcoholic and tobacco cachexias are exceedingly common. A kind of cachexia is not unfrequent as the result of the free use of tea and coffee; that from tea being manifested oftener in women who take insufficient food and depend upon the exciting effect of the beverage "to keep them up." A sallow or parchment countenance, with various distressing dyspeptic and nervous symptoms, marks this state when extreme. Milder nervous affections from the same cause are very common. We find besides those enumerated, malarial, bilious, neurotic, arthritic, anæmic, scorbutic, suprarenal, and other cachexias, produced by the various states indicated by these terms. **Dyscrasia** is a term used as nearly synonymous with cachexia—the first literally meaning a bad mixture (of the vital fluids), and the latter a bad habit (of body). They both indicate a depraved state of the system. The peculiarities of these various changes will be further noticed when treating of the different diseases with which they are connected.

INFLAMMATION.

Inflammation is one of the most frequent, and is the most important of the elementary morbid processes. It constitutes a leading part in a majority of cases both in medical and surgical practice. In very many diseases it is the original and essential condition, and in others, not inflammatory in their origin or essential characters, this process often appears in their course, presenting an element which more than any other determines the result.

The study of its conditions and character, its phenomena, and the means of modifying and controlling it, involves the consideration of questions of the deepest interest in pathology and therapeutics.

In a work upon the practice of either medicine or surgery, the subject cannot receive too careful attention; and while the objects and limits of this work will not allow of a full discussion of the various views which have been entertained respecting it, even in recent times, the main facts, according to our best present lights, will require explicit statement.

The word inflammation literally means "to set on fire," or "to kindle or burn as with a flame," and is expressive of the heat and redness usually accompanying it. As these phenomena, from which the name of this complex process is derived, are not its most essential conditions, other names suggestive of more important facts have been proposed in its place. Thus one pathologist, regarding the arrest of movement of the blood in the part as the most essential condition, proposed the term *Stasis* as the proper designation. Another, regarding the pouring out of material from the vessels into the tissues or into cavities as the essential fact, proposed the term *Exudation;* while another, regarding the abnormal multiplication of tissue cells as most characteristic, proposed the term *Cell-proliferation.* But neither of the conditions indicated by these terms can be regarded as *the* essential fact of this process, consisting as it does of many parts; and indeed neither of them is absolutely essential to the existence of a process which is an aggregate of variable phenomena.

Although an arrest of circulation usually occurs in the most central point of an inflamed part, yet inflammation may be present without a complete stasis of blood; and stasis may occur without inflammation. So with exudation and so with proliferation. Both of these processes are usually present in inflammation; but inflammation may occur without marked exudation or proliferation, and exudations and proliferations are not all inflammatory. Exudation occurs in dropsy and other infiltrations, and proliferation in all morbid growths.

Neither of these nor any other single term will designate a process so complex and variable. The word inflammation, though not expressive in itself of the full process, has the sanction of use as an arbitrary, if not as an explanatory term, and may with propriety be retained.

Various definitions of inflammation have been given, but most of them fall far short of indicating all the conditions belonging to the process. The *classical expression* of *heat, redness, pain,* and *swelling of a part,* is very imperfect as a definition. These conditions are certainly usually present; but neither is essential to inflammation, and each may be produced by other states; and when all are together, giving the local signs of the process, they are not its most essential conditions. They can only be regarded as its common results or accompaniments.

According to an excellent recent authority, "inflammation may be defined to be the succession of changes which take place in a living tissue as the result of some kind of injury, provided that injury be insufficient immediately to destroy its vitality."

Although an injury, mechanical or chemical, gives rise to those forms of inflammation, the minute processes of which have been most carefully observed, there are many internal inflammations where it is not possible to discover any local injury, and when such injury, if it exists, must be presumed; and the definition fails to suggest even a single characteristic of the process. Besides, an injury might be inflicted producing changes different from inflammation.

Dr. Bristowe, in his excellent article on the pathology of inflammation, says: "Inflammation consists primarily and essentially in an unnatural irritability and tendency to undue proliferation of the protoplasmic elements of a part—these giving rise, not as in simple hyperplasia to a mere increase in the number of the normal elements, but to cells which tend to resemble leucocytes, or embryonic cells, and which never go beyond the formation of simple granulation tissue. The connective-tissue corpuscles are those in which inflammatory proliferation chiefly takes place; but all protoplasmic masses . . . readily participate in the process. . . But in connection with these extra-vascular changes, vascular phenomena speedily ensue, and at once take an active share in the processes which are going on. Among the incidents which occur in the course of inflammation, or follow upon it, are exudations, suppuration, ulceration, gangrene, and granulation repair."

This statement, clear and explicit so far as it goes, fails to give any intimation of several processes as essential as those specified.

As inflammation produces structural changes, it involves the nutritive process, and has been called "a change of nutrition." There are, however, other changes of nutrition, not inflammatory, and this does not distinguish inflammation from them. It is, however, a change of nutrition; and, as in all structural or organic diseases, its changes are produced at the same place and by the same instrument as are the processes of healthy nutrition. The same cells, the same vessels, the same blood, and the same nerves are concerned in both the normal and abnormal actions, the one being a modification of the other.

In the following definitive statement, a general idea of all the leading facts of the inflammatory process is attempted to be given; but this must be followed by explanations and fuller statements of details in order to convey a proper knowledge of its many features.

Inflammation is an abnormal process in, or alteration of a part, in which there is a change in the conditions and relations of the elements of the tissues, reducing the molecules and cells to a more embryonic state, when rapid metamorphoses are apt to occur. There are changes in the structure of the walls, in the vitality and relations, the calibre and the actions of the arteries, the veins and the capillaries, by which they become dilated, and also in the lymphatic vessels. There is an increase in the quantity, a change in the state, the relations, and the motions of the blood and of the lymph in the part, with a tendency to stasis of the fluids. There is a tendency to an increased production and an accumulation of leucocytes, an increased disposition in them to adhere to the walls of the vessels, and an increase in their amœboid motions. The red discs also accumulate in the vessels and adhere to their walls, and particularly they crowd into the capillaries, further distending them. There is an increase and also a change in the character of the albuminous and fibrinous elements of the blood, and a tendency to an effusion of the liquor sanguinis containing these elements, and of the lymph, into the tissues; and to the migration of leucocytes, and to a much less extent the red corpuscles, through the coats of the softened and distended vessels, and not unfrequently through ruptures in their walls. There are perversions of nerve actions, either as causes or consequences of the molecular, cellular, vascular, and hæmic changes. There is a tendency to proliferation of tissue cells, and often to an increased but abnormal nutrition of the parts, chiefly in consequence of the increased pabulum furnished them.

There is a tendency to the formation of new products (coagulable lymph, false membrane, pus, and in some situations mucus), and in severe grades of inflammation especially, there is a tendency to the destruction of proper tissues (softening and absorption, ulceration and gangrene). There is perversion or suspension of the function of the organs involved, and the process is ordinarily attended by heat, redness, swelling and pain, and by febrile disturbance of the general system.

This inflammatory process is doubtless set up in a part by some mechanical, chemical, or vital injury or irritating impression upon it; but it is more readily induced in some peculiar general conditions of the system than in others; and a general impression as of cold, suppressed secretions, etc., may result first in a general irritation and fever, and afterward in a local inflammation. The object or effect of the inflammatory processes may be to remove the cause or the results of the injury, but the amount of action is not by any means exhaustion from overaction, or from the direct effect of sedative agents. A diminished supply of blood to a part will cause local depression, as a loss of blood from the body and the other general causes will produce general depression.

Debility resembles depression, but is a more permanent diminution of action, arising from more permanent and slower acting causes, as from starvation or continued disease. It is an important condition, often requiring attention in treatment, but its importance and frequency as a cause and accompaniment of disease have been exaggerated. There are increased and modified, as well as diminished, actions in disease equally worthy of attention.

Shock is a depressing impression, usually violent in its cause and sudden in its occurrence. The depression produced by a mechanical injury, by a violent mental emotion, as of fear or sudden and great loss, or by the rapid onset and severe character of a local disease, is called by this name. It may be mitigated or prevented by agents diminishing sensibility or irritability, such as the narcotics or anæsthetics.

When a shock is not so violent as to completely overcome vital action, it is usually followed by reaction, by increased excitement, by irritation and fever. Shock and the response of the system in morbid action are of frequent occurrence, and are the cause of various diseased conditions, often requiring attention in treatment.

Collapse is a condition of extreme depression, often a result of shock, or is a state scarcely separable from it. The term, however, indicates a condition of more extreme or more permanent depression than that usually understood by shock. The symptoms are coldness and pallor, but sometimes, as in cholera, blueness of surface, particularly of the face and the extremities; perspiration, often profuse, is generally present; frequent, shallow, and sometimes labored or gasping respiration; feebleness of the heart's action, and often imperceptible pulse at the wrist; extreme muscular debility, though occasionally brief, forcible, but irregular muscular action; noises in the ears and indistinct vision; and often, though not always, confusion of thought. The temperature of the whole body sometimes falls several degrees below the normal, and it is usually soon followed by death.

The causes are similar to those of shock and depression, operating in a more extreme degree. The sudden abatement of a protracted and exhausting fever, or other forms of excitement, may be accompanied by collapse; but in other cases it is the result of profuse discharges, of the actions of poisons, or other extreme morbid conditions.

Syncope is a sudden failure of the heart's action, and differs from collapse mainly in this suddenness and in the completeness and more transitory character of such failure. Sometimes when complete consciousness is lost, and often when the patient is passing into this state, rigidity, or occasionally more decided spasms occur.

A more gradual failure of the heart's action, but not necessarily accompanied with coldness or collapse, is called **Asthenia.**

Emaciation is a general diminution or wasting of the flesh, and particularly of the adipose tissue of the body, and is produced by various diseases interfering with nutrition, or producing exhausting discharges, and by deficiency of food.

Obesity is a general and excessive accumulation of fat in the system, and may amount to a positive disease. It differs from fatty degeneration by the fat not taking the place of the normal tissues by substitution for them, but by being deposited in the interstices and connective tissue of parts. The favorite seat of its accumulation is in the external areolar tissue and in the omentum. It may be caused by excessive alimentation, and particularly by too free indulgence in carbonaceous foods; but it sometimes occurs in persons not addicted to any form of alimentary excess.

Fatty Infiltration sometimes occurs as a local condition, fat being deposited in particular organs, as in the liver or heart, and found in the interstices of the proper tissues, but not taking their place. The pressure of the accumulated fat may interfere with the nutrition of the proper tissues, causing waste, and is likely to interfere also with the performance of function. Fat is lower in chemical composition and organization than proper organ tissues, and its accumulation may be a result of arrested or incomplete assimilation of nutrient material.

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Congestion is an accumulation of blood in the capillaries, the arteries, the veins, or the heart; and the term may be applied to accumulations of fluids in the lymphatic vessels. Such an accumulation may result in dilatation of vessels, in hemorrhage, in dropsical effusions, and other exudates; and when occurring in the heart, it may distend its cavities and arrest its actions. Congestion of the brain, or lungs, or other organs, may, when severe, arrest their functions, producing speedy death. From the suddenness with which serious results sometimes follow, the word has terrors to many minds, though it is generally a less serious form of disease than inflammation, pro-cells, will be found invested in a thin, cartilaginous capsule, constituting it a true cartilage cell. Still nearer the injury the proliferation is increased, the cells becoming much more numerous but smaller, losing their cartilaginous or formed capsules, and assuming all the characters of simple embryonic cells, the part thus being reduced to the embryonic condition. The spaces in which these cells are contained enlarge at the expense of the hyaline matter, and often the cells, by crowding together, are found to coalesce. Then at the surface of the wound will be found an irregularly scolloped border, to which is attached and from which has grown the gray film of embryonic cell-tissue before mentioned as on the injured surface. Each of these scollops represents a portion of a primitive cartilaginous capsule, whose cavity has blended with those around it, and the gray embryonic mass is the result of the proliferation of the cell-contents of these and other cartilage capsules.

The effect of an injury in these parts then is, first, growth and proliferation of the protoplasmic or living cell-parts of the cartilage. The new cells soon lose their character of true cartilage cells, and take on the character of embryonic cells. Secondly, there is progressive deliquescence and removal of the hyaline constituents of the cartilage, under this cell growth and multiplication, resulting in its entire disappearance when the proliferation has attained its most advanced stage. The less vitalized hyaline material is doubtless used as pabulum—is appropriated to the nourishment and growth of the cells. It may here be mentioned that more than twenty years ago, Dr. Redfern, of Aberdeen, Scotland, observed as the result of these inflammatory changes in cartilage cells, a transformation of them into well-formed pus cells.

In this process observed in cartilages, is a type of what may occur in the cells and parts of other tissues under inflammatory irritation, in a degree at least, independent of vessels, blood, or nerves. It illustrates also the inherent excitability of the ultimate tissues. Experiments upon the mesentery of adult animals show slight modifications of the inflammatory process as it is observed in cartilages, but essentially the same phenomena. The mesenteric membrane consists of a delicate net-work, the trabeculæ or threads of which are often exceedingly fine; the whole membrane is without blood-vessels in its substance, and consists solely of connective tissue and a thin covering of tessellated epithelium. By exciting inflammation with some irritating material, such as a solution of nitrate of silver applied to the membrane, changes very like those in the cartilage may be seen. After some hours a turbid fluid is found in the peritoneal cavity, the turbidity being due to the presence of cellular elements in different degrees of development, which, instead of adhering to the membrane, as was the case with the embryonic cells on the wounded surface of the cartilage, have become detached and are floating in a serous fluid. On examining a drop of this fluid under the microscope, ordinary pus cells, besides larger cells, containing two or more oval, well-defined nuclei, more embryonic cells, etc., will be found : and the epithelial cells at the surface of the membranous net-work have become larger and more rounded, have lost their cell-walls, have often undergone proliferation, becoming pyoid, and some of them, though still adherent, mature pus cells. These cells adhere irregularly to their points of origin, and are invested and often retained in their original positions by coagulated fibrine, which has exuded from the inflamed surface. If no further irritation occurs, in a few days the floating cells become opaque, undergo fatty changes, and disappear, while those adhering to the net-work structure of the peritoneal membrane, not having advanced to the condition of pus, flatten and resume the ordinary character of serous epithelium. This last fact illustrates the similarity of inflammatory hyperplasia and normal cell production and growth.

Inflammation in the cornea of a frog shows a more complex process. This corneal tissue consists chiefly of a net-work, formed by the union of rays of star-shaped cells, the meshes or intervening spaces between the rays of the cells being filled with an indifferent substance, like the hyaline matter of the cartilage, and with some other material corresponding to the white fibrous bands of ordinary connective tissue. When inflammation is excited by touching a point near the centre of this membrane with nitrate of silver, changes soon take place, spread, and involve the whole cornea, rendering it milky and opaque. At the injured spot and its immediate vicinity the stellate cells first become unnaturally well defined, being a little more granular or turbid than normal. They then swell, their processes or rays become thinner, are retracted, and mostly disappear, and the growing cells assume a nodulated form. They now separate from each other, and become isolated in the corneal matrix, like the cartilage cells in the hyaline substance. They now become more opaque, proliferation commences by divisions and subdivisions of nuclei, each new cell having a covering of protoplasm, until each original cell becomes the parent cell of a group of embryonic corpuscles. There is here the same liquefaction and disappearance of the intervening matrix, and ultimate coalescence of neighboring groups, and the same appearance of embryonic cell element, more or less advanced toward the surface and discharged from it, as in the other cases described.

But here in the cornea something more occurs. While the changes are progressing from the centre where the injury was inflicted, other changes commence and proceed from the circumference toward the centre. These changes consist in the gradual escape of leucocytes from the now dilated marginal vessels, and the passage of these leucocytes by their amœboid motions into the interstitial spaces of the cornea. These spaces they crowd, rendering the cornea more opaque. They, too, multiply, mingling their new corpuscles with the proliferating corneal cells, and they are so like them as not to be distinguished from them. Cohnheim and his adherents regarded all these morbid cell developments as due to the migration of the white corpuscles of the blood, and in some forms of inflammation and in some tissues, the morbid corpuscles are chiefly, it may be in rare instances entirely, derived from this source; but in other instances, as in the cartilages at a distance from the blood-vessels, the corpuscles are entirely from the cells of the part; and without doubt in most instances both the migrated leucocytes and the cells of the tissues unite, as seen in the cornea, in the production of similar embryonic elements. Observations on this point have now been so often and so reliably made and recorded, that there can be no further grounds for doubt on the subject.

From the analogies of physiological and pathological processes the remark may be ventured, that the normal production of cells in healthy nutrition has the same double origin that leucocytes and lymph cells have; or that corpuscles migrate, though to a less extent, physiologically, and aid the cells of the tissues in effecting growth and repair.

Processes essentially identical with those described occur in inflammation of all the tissues—in "vascular" tissues, in connective tissue, in bony substance, in muscles and in nerves, in the proper tissue cells and structures of special organs, as the lungs, liver, brain, etc.; though the cells in these latter organs that have received a high degree of development, and have come to a state of full maturity, may not take on changes so readily as some of the cells mentioned. The connective-tissue cells, the epithelial cells, the cells of glands, and the endothelium of serous membranes—all those that undergo more readily and more rapidly nutritive changes—take on more readily inflammatory metamorphoses, and young elements more readily than old; still, recent observations prove that the proper cells of the brain and liver may be the primary seat of various morbid changes.

Not only outside of the vessels, but within them, in their coats and their contents, important changes take place in the process of inflammation. Some pathologists, indeed, regard the vascular changes as first in occurrence and importance; and undoubtedly, in a majority of cases, changes in the vessels, in their vital endowments and actions, their relations to the blood and the tissues, occur early, and exert a profound influence upon the process.

Among the most obvious external evidences of inflammation are the redness of the part and the throbbing of the arteries leading to it. The redness is produced by enlargement of the calibre of the vessels, and the increased quantity of blood in them. The active processes going on outside of the vessels would create a demand for an increased supply of pabulum, and of the blood which furnishes it; and this increased demand can be supplied only by the vessels, which soon dilate and bring to the part a greater quantity of blood.

If any living, transparent, vascular tissue, as the web of the frog's foot or the bat's wing, be sufficiently irritated, it may be seen that the small arteries of the irritated part gradually dilate, and before long may attain twice their normal calibre—that at length (perhaps in some hours) the capillaries and veins follow suit, and all the vessels become expanded. While these changes in the size of the vessels are going on, changes are occurring in the blood stream within them. While the arteries alone are affected, the rate of flow is increased, and there is a state of active hyperæmia—a condition which has already been described. As the veins and capillaries become dilated also, the flow of blood is retarded ; it usually goes on, becoming slower and slower, the blood oscillating in some of the capillaries ; the white corpuscles accumulate and adhere to the walls of the vessels ; at length the motion in the vessels at the part most advanced in the inflammation ceases, and the blood is in a state of stasis. It now loses much of its serum by osmosis through the vascular coats, or at any rate the serum is largely displaced by the crowding in of the corpuscles, white and red, which often become wedged together in an apparently amorphous mass.

The vessels immediately around this inflamed part have become dilated, and the blood is circulating through them in increased quantity and with increased velocity ; and, as a rule, much more blood flows to and through a part, taking into account the whole organ affected, than normally. This was long ago proved by Mr. Lawrence, who by ligating both arms of a man, one of whose hands was inflamed, and opening freely a vein at the bend of each arm, found more than twice as much blood to flow in a given time from the vein returning the blood from the inflamed member as from the well one. The same difference would not occur in all cases, much depending upon the stage of inflammation, its more active or passive character, etc. ; but usually more than the normal quantity of blood flows to and through an inflamed organ. In non-vascular parts, the vessels in the neighborhood, from which such parts receive their nourishment by osmosis, undergo similar changes of dilatation, and in them an increased flow of blood occurs. Thus an inflammation in the non-vascular part may be fully developed without a stasis of blood at any point. The arteries, the veins, and the capillaries, all, but in different degrees, have the power of active contraction and active dilatation, at least of dilating while tonicity is still preserved; and the increased flow of blood is probably an active process, not only in the heart and larger arteries, but in the veins and capillaries as well; and when the action of the smaller vessels, by impairment of vitality, ceases, the blood flow may be retarded or arrested, though the heart sends it forth with equal force. The adherence of the blood corpuscles to the walls of the vessels tends to block them up and aids in arresting the flow. This disposition of the blood corpuscles is due to a changed relation between the coats of the vessels and the tissues without, on the one side, and the blood itself on the other. Normally there is an attraction by the tissues for the elements of the blood, and a selection of those they need. In inflammation that attraction seems to be increased and to be less discriminative. There are new elements in the blood when inflammation and fever are present—at least new proportions of elements—more solid materials, and the greater attractive power of the tissues seems to draw all the elements, not excepting entirely the red corpuscles, through the coats of the vessels. Whatever be the explanation, in the condition of stasis and crowding of blood corpuscles, the migration of the leucocytes, generally in free quantities, takes place. Their passage is effected mostly through the veins. They are plainly seen to adhere to and penetrate their walls, disappearing from within and appearing on the outside like swelling buds, and at length passing through, they remain attached to the outside of the vein for a short time by a slender thread. This then yields, and the leucocyte travels off among the elements of the softened tissues; mingling with young proliferating cells, as in the case of the cornea. It is at least probable, though it is a point difficult to demonstrate, that there is an attractive force on the part of the tissues, as well as a propulsive force on the part of the leucocytes causing their migration. Some of the red corpuscles follow the white in their passage through the walls of the vessels; but when any large quantity of these are found outside of the vessels, it is doubtless by rupture of their coats.

Associated with the passage of the corpuscles, as already intimated, there is a free exudation of the liquor sanguinis, having in it more solid material than normal, constituting the well-known common *inflammatory exudate*. This is composed largely of serum, but it differs from the effusion which takes place as the result of simple mechanical congestion and pressure. It usually contains a larger proportion of albumen and fibrine, and these ingredients are increased in proportion to the severity, and are varied by the character of the inflammation. The quality of this exudate is otherwise modified by the tissues through which it passes, and by the cavities or surfaces where it is found, as well as by the kind and grade of the inflammation. The swelling which accompanies inflammation is due largely to these exudates, though the increased quantity of blood in the vessels of the part, and the proliferation of the cells of the tissue, aid this result. As the exudate contains more or less spontaneously coagulable material (fibrine) the swelling will be harder or softer ; and when the texture of the inflamed part is loose, a more abundant serous effusion is apt to occur, producing infiltration or œdema of the tissues beyond the limits of the actual inflammation.

In inflammation of mucous membranes the tissue is not only infiltrated, but a free discharge usually takes place from the surface ; and into serous cavities, when their lining membrane is inflamed, a still more free discharge is likely to occur.

In the severer grades of inflammation on serous surfaces a large quantity of fibrine is usually in the exudate, which speedily coagulates, and this, together with a large number of cell-elements, which is a leading characteristic of inflammatory exudates, constitutes the *false membrane* which will be described farther on. The greater number of these cell-structures or elements are probably from the leucocytes of the blood, but the cells of the tissues, multiplied, form a part of these elements.

From the compact structure of the liver and kidneys large effusions cannot take place into their substance, and the effusion which occurs is so mingled with the tissue as scarcely to be distinguished from it. In the kidneys the effusion readily takes place into the uriniferous tubes, and appears in the urine, being detectable there as albumen and casts.

In the lungs, where the texture is more loose and the vessels are less firmly supported, free exudation occurs, often into the connective tissue, but more especially upon the free surface of the air vesicles and the tubes.

How far the retardation of the blood-flow and the exudation of the liquor sanguinis and leucocytes depend upon the blood itself, and how far they are dependent upon the state of the vessels and tissues without, it is not possible at present to determine. Some recent experiments seem to indicate that more depends upon the condition of the vessels, and less upon that of the blood, than was formerly supposed.

Neither is the exact amount of influence exerted by the nervous system, central and vaso-motor, over the process, determined.

Cohnheim asserts that simple congestion of the arteries, however great, never results in increased transudation, but that inflammation is always accompanied by such transudation ; that the swelling of arterial congestion is limited to the enlargement caused by the expansion of the vessels and the increase of the amount of blood in the part, and is not enhanced by any effusion. (?)

In venous or passive hyperæmia effusion takes place, and the swelling is increased beyond that produced by the increase of blood, but heat is regularly wanting. The exudate here has no more of the cellular element than is contained in every normal transudate; but, when the congestion is intense, blood corpuscles may be present. In inflammation the white corpuscles abound in the exudate, and it is very much more concentrated.

That the nerves exert a decided influence over nutrition, healthy and morbid, there can be no doubt; but to what extent these processes may, or do, originate and go on independent of the nerves, is another point not decided.

That tissues possess a degree of impressibility and power of action independent of nervous influence, is shown by the experiments upon fragments of the frog's heart already referred to; and some recent experiments by Cohnheim have shown that inflammation may be induced in a frog's tongue when its connection with the rest of the system was only by the artery and veins. But vaso-motor nerves probably followed the vessels to the part, and for all that is shown, a ganglion, or comparatively independent nerve-element, may have been in the frog's tongue itself, as is in the heart of that batrachian.

That the central nervous element in man has far more control over all his functions than that element has in the frog, is well known; and there can be no doubt that in the human organism the nervous system exercises a very large degree of influence.

The division or paralysis of certain organic nerves leading to a part, is not unfrequently followed by inflammation and other organic changes of that part, and morbid impressions upon nerves may initiate the inflammatory process. Many impressions modifying the actions of vessels and tissues are made upon the nerves, and may be conveyed to the parts either by direct or reflex communication ; still, morbid impressions made directly upon the tissues, as we have seen in the case of the cartilages and the cornea, or impressions upon the walls of vessels, or morbid conditions of those walls, have much to do with their functions in increasing, diminishing, and otherwise modifying the circulation of the blood.

Although inflammation may be produced and sustained by irritating impressions or injuries inflicted upon the elements of the tissues, as proven by experiments upon the non-vascular parts just referred to, yet the action of the vessels, and the exudates poured out of the blood play an important part in the changes of the inflamed tissues. In fact, all these elements act and react upon each other in the production of the inflammatory phenomena, and while we may usefully consider the comparative influence of each as bearing upon the different special objects most important to be aimed at in treatment, yet we must look upon the process in its aggregate of special phenomena, and give attention to its apparent features as found in actual cases.

The blood is undoubtedly changed in inflammation and in the fever accompanying it, in its physical, chemical, and vital properties, and in its relations to the vessels and tissues—sometimes as a cause of other phenomena, and sometimes as a consequence of them. The amount of fibrine is markedly increased, the white corpuscles are in much larger numbers, and the red discs, though accumulating in the inflamed part, are gradually, sometimes rapidly, diminished in the general system, their débris coloring the urine; and the result of this in protracted cases is anæmia and debility. Dr. Lionel Beale regards changes of the blood as the most important element in inflammations and fevers, two conditions which he regards as strikingly analogous—almost identical so far as this state of the blood is concerned. He says that the extractive matter soluble in boiling water is much increased, probably from insufficient oxidation; various substances remaining unoxidized, or but partially oxidized, pass out of the system slowly in a suboxidized state. He thinks an excess of soluble materials in the blood penetrates the tissues, passing through the small vessels more freely than serum, and that these materials are appropriated by the tissues to their detriment; that instead of thus being retained, they should have passed off as carbonic acid, urea, etc. He further states that the bioplasts are increased in size, and that there is increased growth of germinal matter in all inflammations and fevers, showing their analogies. He shows from experiments that there is twice the quantity of matter soluble in boiling water in the blood of cattle affected with the cattle fever that there is in healthy ox blood, and that the blood contains more solid matter in these cases than normal blood as shown by evaporation. He thinks this matter forms a pabulum which is very readily appropriated by degraded forms of bioplasm in the diseased tissues, leading to morbid products. He doubts what is believed by others, that any morbid state is produced by too much oxidation, or peroxidation, and affirms his belief that insufficient oxidation is general in diseases of all kinds. Whether these views be correct to the extent declared may well be questioned, but the high authority of Dr. Beale renders them worthy of attention; and that very many diseases are accompanied and aggravated by diminished oxidation there can be no doubt. That changes in the blood occur and contribute, often largely, to the morbid phenomena, both in inflammation and fever—conditions so nearly allied that fever always accompanies inflammation, sometimes precedes it—cannot be questioned.

The blood of a person laboring under an inflammation, when standing in a vessel after being drawn, is *buffed;* as, either by its slower coagulation, or by the more rapid sinking of the corpuscles from adhering together, the coagulated fibrine at the top of the vessel has not closed within its meshes sufficient corpuscles to give it the usual red color of the clot; and it is *cupped,* has a concave or cup-shaped surface from shrinking at the top, as it coagulates, more than below, where the corpuscles have gravitated, preventing so much contraction and keeping up its bulk.

Besides these more apparent, and perhaps more constant, changes in the blood, there are doubtless various vital changes—changes in its activities and relations to the tissues, in its function as an oxygen carrier, etc.—less demonstrable, but not less important; and further, it is the receptacle of various substances foreign to itself, as previously pointed out, which act as excitants to inflammatory and other morbid processes. These foreign substances, taken in from without, and often multiplied within the system, or those materials generated there, are the common causes of specific inflammations, as well as the whole class of zymotic fevers.

We have seen how the tissues are changed in their histological elements. In their grosser appearances swelling commonly occurs, and, as already intimated, is partly from the increased quantity of blood, partly from proliferation of tissue cells, but more commonly from the exudation which occurs; while the proper normal tissues, especially in severe cases, change in the direction of decay.

The nerves of an inflamed part are irritated by the process, are often pressed upon by the exudates, and sometimes disintegrated by the destructive changes. As consequences there are sensations of burning, of pain, frequent throbbing, and of tenderness; and there are various sympathetic irritations in more or less distant parts.

The *inflammatory exudates,* or the matters appearing in sensible amounts as the products or results of the inflammatory processes, are serum, blood, mucus, pus, and lymph, or common inflammatory exudate.

Serum is exuded through the coats of the vessels, favored by the internal pressure, by the distention, attenuation and softening of their walls, and by the looseness of the texture of the parts, or the freedom of the surface involved in the inflammation. The character of the surfaces or tissues, and the kind and degree of inflammation also modify its effusion. More or less serum is mingled with all the other exudates.

Blood is not unfrequently found, as a result of inflammation, either in the tissues or upon surfaces, mingled with other inflammatory products. As already stated, to a limited extent and in small numbers, red blood corpuscles may pass through the coats of vessels without destruction of continuity; but when they are in any considerable amount, rupture of vessels has, generally at least, taken place. In dysentery and pneumonia blood is commonly present in the exudates, and often inflamed tissues are stained with blood poured out into their structure.

In ulcerative processes blood is frequently effused from the opening of vessels, and sometimes in large quantities.

Mucus is commonly freely produced in inflammation of mucous membranes. D. I. Hamilton, M. B. F. R. C. S. Ed., L. R. C. P. Ed., Demonstrator of Pathology, University of Edinburgh, and Pathologist to the Royal Infirmary, in his careful study of acute bronchitis, says there is an abnormal production of the fluid matter of the mucus, and of small spherical cells, or mucous corpuscles, a peculiar kind of secretion from the mucous follicles, mingled commonly with leucocytes from the blood, and with detached or aborted epithelial cells from the membrane. This latter is the chief source of the mucous corpuscles in acute bronchitis.

The young cells manifesting life are either from leucocytes, or are produced within the epithelial cells by endogenous multiplications. Between the appearance of mucous corpuscles and pus, there is no clear line of demarkation, and frequently well-formed mucous globules and pus corpuscles are mingled together. The difference between the two is often one of degree of development. The severer the inflammation, the greater the tendency to the production of pus.

Pus is another product of inflammation, and is never produced without that process. Its formation and accumulation is called Suppuration. What is called "laudable pus" is a homogeneous-looking creamy matter, of bland consistence and mawkish odor; but when examined with a microscope it is found to consist of globular bodies floating in a serous, alkaline fluid, called the Liquor Puris. This fluid resembles the liquor sanguinis; but in addition to the ingredients of the latter fluid, the liquor puris often contains a peculiar albuminoid substance called pyine, and may also contain a moderate quantity of other substances, as a little blood, and occasionally vibriones, without destroying its character as laudable or "orthodox pus."

The pus corpuscles, as seen in the tissues, are scarcely distinguishable from leucocytes. As seen after removal from the body, with proper magnifying and defining power, they are spherical, spheroidal, or more irregularly-shaped semi-transparent bodies, from the $\frac{1}{3000}$th to $\frac{1}{2500}$th of an inch in diameter, containing a variable number of granules, especially upon the surface, and usually one or more distinct nuclei. The addition of dilute acetic acid clears away some of the granules, causes the cells to swell, they become more transparent and spherical, and the nuclei are rendered more visible. There are variations as to the size of the corpuscles, the amount of granular matter, and as to the number and size of the nuclei. Young pus corpuscles, white blood corpuscles, lymph corpuscles, and many other young cells from proliferating tissues, are often undistinguishable; all consist of masses of contractile protoplasm, and are often called by the common name of leucocytes or pyoid cells. They all possess the power of spontaneous movement, of appropriating nourishment, and of growing, are capable of multiplication, and thus present all the necessary properties of living matter, and while living they undergo continuous alterations in form and location, wandering among the tissues. There is but slight microscopical difference between even typical pus corpuscles and the corpuscles developed previous to the full suppurative stage of an inflammation, by the proliferation of connective-tissue cells and other stationary protoplasmic bodies; and as little difference between them and the emigrant leucocytes; and beyond question the pus cells originate both in altered tissue cells and in the white corpuscles of the blood. "Indeed, at every suppurating surface the gradual transition of the one into the other may be readily observed."—(*Bristowe.*)

It is, however, doubtful whether full-formed and completely mature pus cells are then capable of multiplication, and it is certain that their more active vitality ceases very soon after their maturity; and although they retain for a much longer time sufficient life-force to prevent decomposition, they are incapable of further development; they never, like other cells, form fibres or tissues, and they change slowly, and only in the direction of degeneration and decay.

The term "dead blastema," applied to pus as a short definition, or as descriptive of its nature, since the advent of more exact knowledge and the abandonment of the old doctrine of blastema, or of a formless fluid out of which forms are produced, must of course disappear from the vocabulary of those who do not linger too far behind the advancement of pathological knowledge. It was never consistent even with the theory of blastema, and the only apology for its use was in the fact that when fully formed and entirely mature, pus corpuscles were incapable of further developmental changes, and like other mature organisms must either remain stationary, and that but for a time, or sooner undergo the process of death and decay. On no rational theory or supposition could an organic particle or body like the pus corpuscle, with a cell-wall and its contents, especially its nuclei, be the result of the death of a homogeneous substance, though capable, when living, of producing forms, as the fancied blastema was supposed to be. Organisms, however simple, are produced by a process of life, not of death. The forms supposed to be produced from the "blastema," were no longer the "blastema" itself, and "dead blastema" must at least be as devoid of organic forms as living. But the clear observation of facts displaces errors, and no further refutation of this is required. In the light of the microscopical observations of the inflammatory process in transparent tissues and on suppurating surfaces, already noticed, it is not difficult to trace some of the steps which lead to the development of pus (not to the death of a fancied homogeneous substance which was thought capable of producing forms), and it would seem that further controversy in regard to its origin must cease.

We have already seen that when inflammatory proliferation is going on in a tissue, the indifferent or less vitalized stroma between the groups of active cells is softened, eroded, and disappears, and neighboring groups of cells come together and constitute a continuous mass of embryonic or young cell tissue. These cells, thus in contact for a time, cohere together, either in the manner of epithelial cells, or by some scanty adhesive material. It needs only the separation of these cells by the loss of this cohesive property, which may be effected by the pouring in of serous fluid constituting the liquor puris, and a trifling further maturation of the cells, to constitute perfect pus. It is thus essentially that suppuration, in part at least, takes place at the surface of an ulcer, and also in this manner abscesses form; but in addition to these changes in the tissue cells, the white corpuscles of the blood, increased and made more active by the inflammatory excitement, gather to the part, penetrate the vessels and other changed tissues, and mingle with the embryonic tissue cells, partake of their character, and join with them in their after course.

In the formation of an abscess, softening occurs at the point of the most advanced changes in a proliferating region, and the cells which would otherwise have formed a solid exudate, and perhaps have been formed in time into a solid, adventitious, but living tissue, change, by separation and slight modification, into pus corpuscles; and the swelling, which before was more or less hard and firm, becomes soft and fluctuating.

By the extension of this process; by the conversion of the tissue cells into embryonic and pus cells; by the erosion and transformation of the less vitalized material; by the appropriation of its matter and of the matter of the albuminous exudates from the blood to the growth and multiplication of the cells; and by the swarming in and multiplication of the leucocytes, an abscess obtains its dimensions, spreads in the direction of the least resistance, usually toward the surface of the body, and sometimes forms with astonishing rapidity. The pus corpuscles within the cavity, if not obtaining an outlet sooner or later, sometimes quite soon, especially in low conditions of the system, undergo degenerative changes, lose their vitality, and perish. Their protoplasm is replaced by fatty particles, and they swell and break up, or they contract and become opaque and angular, or calcareous deposits take place within them, forming a mortar-like mass or a cheesy detritus; and as softening goes on absorption follows, and a more or less perfect cure of the abscess ensues. A natural or artificial opening of the abscess and discharge of its contents often greatly hastens the cure.

Pus, when "laudable," forming in an abscess or elsewhere in a person of vigorous constitution and free from septic tendencies, and when the injury is not so severe as to lower general or local vitality too much, does not readily yield to chemical forces, but long resists decomposition.

But pus of recent formation does not always present the character of laudable pus, as described. It sometimes is thin and watery, and is called *ichorous pus*; it sometimes contains a more or less free mixture of changing blood, and is said to be *sanious*; and sometimes it contains particles of dead and decomposing tissue, or dead and decomposing exudates, and is *fetid* pus, and is often then very irritating and poisonous, especially when in connection with large surfaces; and when absorbed into the circulation the most disastrous results follow, and it is called *septic* pus. The presence of bacteria favors these as well as other decomposing changes, and aggravates all the symptoms, general and local. In practice with open wounds, these bacteria require exclusion and destruction by cleanliness and various antiseptic means.

In certain conditions of the system the pus cells, almost or quite at their formation, are imperfect, shriveled, and irregular; and sometimes, instead of being fully developed, many are left in the form of granule cells, or mere molecular debris. In severe crushing injuries, gunshot wounds, etc., even in previously healthy persons, some parts may be deprived of vitality, and others so severely injured as to become necrosed, while other adjoining parts are only so much injured as to excite inflammation. In these cases the pus will be mingled with dead and decaying tissue in various proportions, and when "laudable" pus appears the signs are more favorable. Here the formation of pus often appropriates injured material which might otherwise putrefy and become a source of septic infection.

Though the formation of pus is always an inflammatory process, and therefore abnormal and in a sense morbid, yet the production of "laudable" pus is often spoken of as "healthy" suppuration, to distinguish it from those more injurious forms just mentioned.

In connection with the production of pus and the formation of abscesses, the destructive effects of inflammation have already been adverted to. These destructive processes are shown in the softening and disintegration which take place in the less vitalized stroma, or hyaline substance of cartilage, in the white fibrous element in connective tissue, and in the earthy matrix of bone and other parts, while the cell multiplication is in progress.

Destructive or degenerative processes often occur in inflamed organs, in elements not the immediate seat of the proliferative changes, in consequence of the pressure of exudates, or the deranged and enfeebled nutrition from contiguous sympathy, or from the heat of fever and the general derangement which an inflammatory condition induces. Destructive changes occur in a more marked form in the processes of ulceration or necrobiosis, and in that of gangrene or necrosis, as the results of inflammation. As already stated, an injury may be so severe in a part as to deprive it of life, while an adjoining part may be excited to inflammation. But gangrene may be the effect of an inflammation. This may result from the obstruction of arteries supplying the part, by clots forming within them, or by thickening of their walls, or by pressure upon them by exudates, thus arresting nutrition; and the extreme heat and other morbid actions of an intense or an adynamic inflammation, independent of these obstructions, may overcome vitality and produce the same destructive results.

In inflammatory gangrene the parts are generally moist and swollen; as in the preceding process, they are infiltrated with exudates.

In ulceration or necrobiosis the destruction, instead of being in mass, is molecular or in small fragments, and is progressive while the process continues. It resembles the destruction of elements in suppuration, as already described, but differs from it in involving more indiscriminately the tissues, and in the open character of the sore. In ulceration there is excavation of the surface, the destroyed material being thrown off in the form of pus and of small devitalized particles of tissue; and sometimes a portion of the softened and liquefied material is absorbed away. When the destructive process has ceased, and granulation and repair are going on, the sore is called an ulcer until the healing is complete.

Common inflammatory exudate or coagulable lymph is a characteristic product of inflammation. It consists of the liquor sanguinis, which, however, contains more than the usual amount of fibrine, readily coagulating or fibrillating on being removed from the vessels. It also contains corpuscles derived from the blood, and particularly from the proliferating tissue cells. It contains the same corpuscular elements already described, but with the addition of fibrine and other albuminous matters exuded from the blood.

This lymph exudation or deposit may be in tissues or upon surfaces, and is most characteristic or typical on serous membranes, though excellent specimens are often found between the lips of wounds. As recently exuded upon a surface, it is a straw-colored, gelatinous-looking substance, of greater or less tenacity, according to the proportions of fibrine, corpuscles, and serum it may contain, and is in layers of various thickness, from a thin film to several lines in depth.

This material, whether deposited within tissues or upon surfaces, may undergo different changes. The fibrinous materials may be dissolved in the fluid exudated, and the corpuscles may be released and develop into pus, or the whole may liquefy and be absorbed away. In other cases the fibrinous felting may retain its consistence, the corpuscles elongate, shoot out processes, and form into fibres, and these elements uniting may form a tissue of some thickness, or the corpuscles may be flattened out into epithelial cells.

When this fibrinous and corpuscular material is in any considerable quantity deposited upon a surface, it is called a false or adventitious membrane. It may remain for some time comparatively unaltered, it may break down and be removed, or it may receive blood-vessels in loops from the parts upon which it is deposited and become organized into a living tissue; in time, lymphatics and nerves may be found in it, and it may become a part of the body itself. In the formation of this organized new tissue the fibrine seems to serve as a scaffolding for the corpuscular elements, which are more vitalized, and by their change form the more permanent tissue. The fibrine, having served its purpose, appears to be removed. D. I. Hamilton, before referred to, is of the opinion that neither the fibrine nor the white corpuscles, nor any of the elements of the blood, enter into the structure of false membrane when fully organized, but that all the living elements are from the proliferated tissue cells. This adventitious structure takes the character more or less of the tissue in connection with which it is formed, but it still tends to remain a fibrous structure. Its organization and vitality is not of as high an order as natural tissue, and it more readily undergoes destructive changes. It is highly vascular at first, but much less so in time; and by losing many of its vessels and becoming of a more compact texture, it *contracts* for many weeks after its organization, and this contraction, by compressing organs which it surrounds, or distorting parts with which it is in contact, may produce the most serious mischief and interfere with various functions. In some cases, after advancement in organization, it is gradually absorbed and disappears, while in other cases it becomes not only a real, but a fixed and permanent part of the body. When a false membrane becomes organized between two surfaces, it causes adhesions, sometimes binding them together with great firmness and persistency, while in other cases such adhesions become less firm and give way. A false membrane is subject to inflammation and morbid growths, even more so than the natural textures. In wounds and loss of tissue it becomes a means of repair, but on the valves of the heart and in various situations it may be a cause of disease and death.

A modification of the production of adventitious structure occurs in the process of granulation. Granulations are described as rounded masses of cells produced by cell proliferation (and as is thought by some, by immigration of leucocytes also), upon a wounded or denuded surface. The cells at first are embryonic in character, and many of those at the surface are shed as pus, while others become fixed, retain their vitality, change into tissue cells and fibres, and build up a new or adventitious tissue upon the foundation of the old or normal one. When these granulations shoot up rapidly and become exuberant, and especially if extending above the normal level, they are called "proud flesh." Sometimes granulations appear upon irritated and inflamed surfaces, as upon the conjunctival surfaces of the eyelids, or upon the mucous membrane of the throat, as a morbid process where repair is not effected or required.

According to Hamilton,* granulations are loops of capillary vessels pushed from wounded or denuded surfaces by blood pressure, carrying with them attached tissue material. Leucocytes are thrown out when inflammatory irritation is present producing pus, and some of the tissue cells are converted into pus cells; but in his opinion the leucocytes take no part here or elsewhere in organization. The capillary loops, Hamilton insists, are pushed out on mere mechanical principles, from not being supported by a cutaneous covering, and when exuberant should be kept down by pressure. It is evident, however, that in these granulations, cell proliferation takes place, as in healing by granulation new texture is formed.

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* Edinburgh *Journal*.

The structure formed by this and all the methods of inflammatory organization is called "cicatricial tissue," and that produced by granulations is of the same character and follows the same laws as the organized false membrane already described. At first, like false membrane, it is abundantly supplied with blood-vessels, and to a considerable extent with lymphatics; but later the vessels are diminished, and the plasmatic cells become few, and the scar texture consists chiefly of dense interstitial fibrous substance. It becomes bony when in connection with bone, contains fat when replacing fatty tissue; but it results only in some of the lower forms of animals in the reproduction of the highest forms of tissues, and only in them are lost parts fully restored. Hair and glands do not generally appear in new-formed skin.

In exceptional cases external inflammatory proliferation becomes chronic, going on slowly but persistently for a long time. The new tissue, instead of contracting and hardening, remains bulky and soft, and presents a keloid-looking, projecting, cellular, and vascular mass, tending to degeneration and the taking on of other morbid processes. Somewhat similar internal processes also occur, leading to various degenerations.

Cicatricial tissue may heal wounds, repair losses of tissue, stiffen joints, produce strictures, form adhesions, and result in degenerations —it may improve or restore functions, or impair or destroy them— may do good or evil according to its situation, extent, and course. The kind and quality of the exudates of inflammation are determined by the seat, the degree, and the special character of the inflammation, and by the state of the general system and the blood.

An ordinary inflammation of a mucous membrane produces mucus, and if severe, pus, and more rarely fibrous or plastic exudates. That of a serous surface, if mild, produces almost pure serum; but if more severe, plastic matter, especially if there be high general vitality; while in other cases of severity, especially when there is a somewhat lower state of the system, pus is produced. The milder the inflammation, the nearer the exudate will be to the natural product of the part.

Plastic exudates are more likely to be produced in vigorous conditions of the system, and are promoted by tonics, iron, acids, bitters, and good food.

Aplastic products are more apt to occur in low conditions of the system, and are promoted by mercury, antimony, alkalies and salines, and a low or innutritious diet.

Different kinds of inflammation tend to the production of different exudates. Thus, in erysipelas, plastic exudates are not produced, and in rheumatism, suppuration is almost unknown.

In order to the complete organization of a false membrane, the inflammation in the part must subside and the action approach the healthy standard. While the inflammation continues so that exudates are poured out, and especially if pus is produced, organization will not take place.

In the inflammation of mucous membranes covered by pavement epithelium, pus may be produced in free quantities without ulceration; but in mucous surfaces lined with cylindrical epithelium, a free suppuration does not take place without ulceration.

From the description of inflammation given, it will be seen that the most noticeable changes in this process are:

1. Distention of vessels, producing hyperæmia and redness of the part.
2. Changes in the current of the blood.
3. The embryonic state of the cells of the tissues, in which they change their form and are increased in their activities, are multiplied and often enlarged.
4. The exudation of serum, the liquor sanguinis, and blood corpuscles, and the production of pus and coagulable lymph.
5. The hyperplasia of tissue, or the production of adventitious tissue.
6. Swelling, from the increase of blood, from the exudates, and from cell multiplication.
7. Heat, produced by the freer quantity of blood brought to the part, the arrest of its motion, and the more active chemical and vital changes, constructive and destructive, which take place. When the inflammation is at the surface, the change of temperature is greater, as the ordinary temperature of the skin is lower than that of internal parts or of the blood at the heart, and the free flow to the part, and the greater molecular action brings the temperature up to almost that of the blood in deep parts; but Cohnheim agrees with the statement of John Hunter, that the temperature of an inflamed part never exceeds that of the blood at the centre of circulation.
8. Pain, produced by involvement and pressure upon the nerves; and it is more or less severe according to the nervous endowment

and natural susceptibility of the part, and the greater or less firmness and unyielding character of the tissue.

9. Defective nutrition of the natural parts, and the softening, absorption, degeneration, ulceration, and gangrene which occur.

The **Causes** of inflammation are various. There is always some injury to the part, but the agents producing the injury are various, and some of them obscure. Excessive irritation, whether mechanical, chemical, or vital, which interferes with the conditions of healthy nutrition, whether first impressing the tissues, the nerves, or the fluids, may result in the changes which have been described. A serious disturbance of the blood supply, a change in the quality of the blood by zymotic or other poisons introduced into it, morbid impressions upon the nerves supplying the tissues and vessels, whether directly or by reflex action, may produce the effect. In certain impressible conditions of the system, or of particular parts, causes that would have little effect in other states may produce inflammation.

"Taking cold," exposure to cold, and often moisture, when applied to particular parts of the body, are considered among the most frequent causes of internal inflammation. Such exposure produces its effect by an impression upon the cutaneous surface, making an irritating impression on the nerve filaments, which is conveyed to other parts by reflex or sympathetic action, by checking perspiration and the retention of effete matters, and by the driving of the blood to internal organs, diminishing its circulation in the external plane.

In many cases the cause of an inflammation is conjectural, and the mode of action of attributed causes is a matter of speculation and theory rather than of demonstrable fact.

The **Symptoms of Inflammation**, those portions of the phenomena which are perceptible to the senses, giving evidence of the pathological state, are divided into local and general symptoms. The *local* evidences which are objective, are redness, heat, and swelling; and those which are subjective are pain and tenderness, the latter—pain on pressure or motion—often leading to the detection, where other local evidences are wanting.

An inflammatory swelling may be *hard*, produced by more solid exudate, or *soft*, arising from the hyperæmia, and especially from the more fluid effusions. It may be *pitting*, when the serous exudate effused in the areolar or connective tissue is removed from a point of pressure, and slowly returns when the pressure is removed. It may be *elastic*, when a soft exudate is present, but prevented from passing freely through the tissue by the presence of more solid and tenacious material. The swelling is said to be *boggy* when pus or some other fluid is effused in a tissue weakened and more than normally porous;

and the swelling is *fluctuating* when pus or fluid material is collected in a cavity, is free to move from one point to another, readily yielding to sudden pressure, and giving an impulse at a point distant from the tap or pressure.

The skillful touch, by which different conditions are distinguished, has been called the *tactus eruditus,* and needs to be cultivated.

The changed or suspended functions of organs inflamed are among the most important evidences of a diseased state, and stand between the local and general symptoms.

The *general symptoms* of inflammation are particularly important to the physician, as in internal diseases those of a local character may be beyond his reach. When inflammation is present to any considerable extent, and especially after continuing for some little time, the blood is, as already stated, buffed and cupped, when speedily drawn and after standing in a proper vessel until coagulation has occurred. The fibrine is increased often to three or four times its normal amount, and the number of white corpuscles is usually very sensibly augmented.

From the increased destructive metamorphosis of tissues, and the absorption of its results by the blood-vessels and lymphatics, and by the comparative diminution of excretions which commonly occur, and at a later period from absorption of the inflammatory exudates, there is an accumulation of effete matters in the blood ; but they are more noticeable in the general disturbance induced, and by their appearance in the excretions, than by their detection in the blood.

The most marked constitutional effect of an inflammation is the *Fever* which it induces, and which so generally accompanies it.

Febrile symptoms soon follow an inflammation, produced by whatever cause, even by a strictly local and mechanical injury; and in what are called idiopathic inflammations—inflammations not dependent upon any obvious local cause—the symptoms in the part attacked are sometimes preceded by a general febrile disturbance, showing that the general system is concerned in the production of the local phenomena. The multiplication of leucocytes and the increase of fibrine must be, to some extent at least, systemic processes, and they may occur before the local evidences of inflammation are marked. These febrile symptoms are doubtless induced in part, and are kept up, by the impurities and changes in the blood already mentioned. They are in part, however, caused by the local suffering, communicated by sympathy to the system at large: and it may not be unreasonable to suppose that, by the evident intelligence which is manifested in nature, the feverish excitement is an effort of the system to resist and repair the injury inflicted.

It is alleged that the blood flowing from an inflamed part in the veins is of a higher temperature than that flowing to it in the arteries, and if this be so, this heated blood circulating through the body must aid in the general increase of temperature.

It is now well known that increased heat much above the normal of the body, of itself interferes with nutrition, tends to degeneration, and affects very unfavorably the general functions of the system ; and a part of the general disturbance is therefore due to the elevation of temperature produced by the heated blood from the inflamed part.

Diminished perspiration, when it occurs, by diminishing the loss of heat, must result in an increase of temperature. Another cause of systemic suffering is the changed action of the organ, the seat of the local disease, produced through dependence of function. Thus, when the lungs are extensively inflamed, the respiratory process is imperfectly performed, and blood, imperfectly oxidized, carried to the brain and other organs, impairs their functions; and it is similar when other important organs are inflamed.

The effect of morbid impressions on the nervous element conveyed to those portions of the brain which preside over circulation, secretions, calorification, and other organic functions, must not be overlooked in accounting for fevers in general, including the fever of inflammation. This subject will again be referred to in the description of the febrile state.

The ordinary phenomena of symptomatic inflammatory fever are, a general feeling of indisposition, and rigors, or a sense of coldness early in the attack, marking the period of onset. The chills are sometimes severe and continued for a few hours, while at other times they are short and slight, and generally toward the latter stage of the chilliness especially, are alternated with sensations of heat. At length the sensation of heat is the predominant feeling, and the temperature rises several degrees, the amount of increase depending upon the severity of the inflammation and the susceptibility of the system, and upon the amount of loss of heat from the surface. The chilliness may be repeated, especially if the inflammation be extending, but its recurrence is uncertain and irregular when it takes place. With the increase of temperature the pulse is increased in frequency, and usually in force, though it may be diminished in force when the disease is so extensive as to produce decided shock. With the increase in the frequency of the pulse the respiration is generally increased; and there are general pains, chiefly in the head and back, and these are sometimes quite as severe as those in the part inflamed. There is thirst, diminished appetite, and commonly a coated tongue, and in most cases a general diminution of the secretions. There is change of innervation, of nutrition, of secretions and excretions, and more or less of all the functions of the body. There is particularly to be noticed destructive metamorphosis of the tissues, resulting in wasting and debility; and as the excretions are not correspondingly increased, this increased waste results in the rapid accumulation of effete matters in the system; and this accumulation is contributed to by the production and absorption of inflammatory products from the seat of the disease.

Inflammatory fever may be of a Sthenic type, manifesting much activity and force, or Asthenic or Adynamic, manifesting less force. It may be of a Nervous type, the sensibility and mobility, the functions of the mind—all the functions of external relation being much disturbed. It may be Ataxic, irregular in its course and phenomena; and when pus or septic matter from the diseased part finds entrance in free quantity into the blood, a peculiar form of fever of great severity and danger occurs, called Pyæmic, Septic, or Toxæmic fever. A form of inflammatory fever, occurring in wounds and after operations, is called a surgical fever; and as pyæmic and septic fevers are more common in surgical than in medical practice, these fevers are more fully described in works on surgical pathology and practice.

The more distinctive phenomena of toxæmic fevers are: repeated chills, a high temperature—often hyperpyrexia—frequently free perspiration but still great heat, and a dry and parched tongue, decided delirium, a rapid but feeble pulse, and special irritation of the intestines, commonly accompanied with diarrhœa. This form of fever is exceedingly dangerous, and is more frequently met with when large numbers of surgical cases are crowded together, and where cleanliness, ventilation, and other hygienic measures are not properly observed.

In chronic inflammations, especially where suppuration and wasting occur, a special form of symptomatic fever, called *hectic*, is produced. Its more marked features are diurnal periodicity, chilliness of variable severity and continuance occurring in the fore part of the day, followed by a higher temperature, irregularly distributed on the surface, usually with a circumscribed flush of the cheek; and in the night free, uncomfortable sweats occur, followed by a reduction of the temperature continuing during the morning and until another exacerbation returns.

Generally an inflammatory fever abates as the inflammation subsides, but it is sometimes kept up, possibly by habit, but more likely by impurities of the blood; but it disappears when both the inflammation and impurities are removed. The fever also often abates when free suppuration or other effusions occur; the skin then becomes moist, and sometimes a chilliness is experienced. When an inflammation results in gangrene to any considerable extent, the temperature, at least of the face and extremities, falls, and a state of collapse commonly ensues.

Varieties of Inflammation.—We have been considering inflammation in its general or common features, but it has several varieties which will require pointing out. These varieties depend upon the degrees, types, and kinds of inflammation.

An Acute inflammation is one which is intense in degree, and recent and brief as to duration, and is usually produced by some cause inflicting a severe injury, and the changes are likely to be destructive.

A Chronic inflammation is one which is protracted in continuance and moderate in degree. It may be of large extent, but is more gentle and slow in its processes. The injury in these cases is usually not so severe, and the changes effected are more textural and often constructive. These productions, as the false membrane produced in cirrhosis of the liver, may, by contracting and obstructing the vessels, lead to atrophy, by interfering with circulation and nutrition. A protracted case may consist of a series of acute attacks, but the inflammation would not be called chronic merely from its long continuance. The idea of comparative moderateness is included in the term chronic.

A Subacute case is one between the acute and chronic forms.

The terms severe and mild scarcely need an explanation. They have reference to degrees rather than extent or continuacce.

A Sthenic inflammation, like a sthenic fever, is one manifesting much force of action, vigorous circulation, and much heat, often with productive changes.

An Asthenic or Adynamic inflammation is one where little force is manifested, and where the destructive processes are likely to predominate.

A Congestive or Passive inflammation is one in which a slow circulation, with distention of the veins and capillaries, is present, and where slow and moderate changes, either constructive or destructive, occur.

A Latent inflammation is one that is internal and hidden, or where the marked ordinary symptoms are concealed.

A Patent inflammation, on the contrary, is one that is open and apparent, where the ordinary signs are well marked.

An Erythematous inflammation is one that is superficial—upon a surface.

A Phlegmonous one affects the deeper tissues and tending to the production of a phlegmon or abscess.

A Parenchymatous inflammation is one involving the solid substance or parenchyma of an organ, in contradistinction from one confined to its surface or covering membrane.

Again, inflammations are divided, according to the causes producing them, into Traumatic, produced by a mechanical or chemical injury, and Idiopathic, occurring apparently spontaneously or from some cause less apparent.

Inflammations are also divided into Common Inflammations, or the ordinary forms common to all persons, and with phenomena common to all the forms, and capable of attacking any tissues, excited by the ordinary causes, as mechanical or chemical injuries, or exposure to cold, etc.

The contrasting varieties are the Specific inflammations, those depending often upon specific or infectious causes, and having phenomena and courses peculiar to themselves. The contagia of smallpox and all the exanthems produce inflammations of a specific kind, affecting the skin and mucous surfaces in a peculiar way, and running a more or less definite course. Other cutaneous inflammations, not infectious, have specific characters ; and the Syphilitic, Gonorrhœal, Erysipelatous, Diphtheritic, Rheumatic, and Gouty inflammations are peculiar and specific.

Strumous and tuberculous inflammations are varieties depending upon constitutional peculiarities of the patient, and differ from common inflammation in their phenomena and results. They will require a more particular description in connection with an account of the scrofulous or strumous and tubercular states.

Dr. Francis Delafield makes seven varieties, dependent upon the particular tissues involved and the special manner of their involvement.

1. Cellular inflammation, involving chiefly the fixed connective-tissue cells, increasing them in size and number, while the blood-vessels and basement substance are scarcely changed.

2. Inflammation with production of exudates—serum, fibrine, and pus—involving principally the blood-vessels, through which are transuded these materials.

3. Necrotic inflammation, involving both vessels and tissues, causing death of parts, with or without putrefaction.

4. Inflammation with formation of abscesses, described as a complex process, involving both vessels and tissues, producing destruction of tissues and the formation of pus from tissue cells and leucocytes.

5. Reparative inflammation—changes resulting in the formation of new or adventitious tissue, repairing injuries, or, as we have seen, causing mischief when there was no mechanical injury to repair.

6. Hyperplastic inflammation—inflammatory growth of new connective tissue, both of cells and basement substance, not necessarily preceded by the production of pus or fibrine, or of cells alone. This seems scarcely distinguishable from the fifth.

7. Tubercular inflammation, a form resulting in the production of tubercle, composed of reticulated basement substance, of flat nucleated cells and giant cells.

An inflammation may be arrested, either spontaneously or by treatment, in any stage of its progress, not necessarily going through with all its phenomena. When it suddenly abates and disappears from one part, and at the same time appears in another, there is said to be a metastasis of the disease.

When it recedes to the normal state from its earlier stages, or before suppuration, much effusion, or material structural changes occur, it is said to terminate by Resolution. The moderate exudations that have been poured out are absorbed and eliminated, and the part returns to its original state. The more the exudate, and the more solid in character, the longer is the time required for its removal; and when destructive changes have occurred in the tissues, time will be required for their repair. Large quantities of serous effusion in the cavities, as in the pleura or peritoneum, are sometimes removed with great rapidity when the inflammatory process has ceased. Much more time is required to dispose of fibrous, corpuscular, and purulent exudates, as they require disintegration and solution before absorption; but in time and under favorable conditions quite free quantities of both may be removed.

Inflammation is spoken of as terminating in Resolution, in Effusion, in Adhesions (by false membrane), in Suppuration, Ulceration, and in Gangrene.

From all the preceding statements it will be seen that though the different forms of inflammation have some things in common, it is a very complex and variable process, and is not an identical condition; that it varies in its causes, its particular processes, and its results, and that the same management will not be applicable in all cases.

Varieties of inflammation called Strumous and Tuberculous have peculiarities of such distinctive characters as to require a more particular consideration in connection with the conditions of the general system which give them that name.

The Scrofulous and Tubercular Diatheses have engaged the attention of physicians during a long period of medical history, and the question is not yet settled as to their identity or distinctive characters.

When diseases are considered as they should be, and now so generally are, not as entities, but as series of modified actions, it is not easy, nor is it essential, to determine what constitutes *identity;* and this difficulty depends chiefly upon the differences of meaning given to the same terms. Identity of cases of disease, in the sense of exact likeness, never occurs; but identity only occurs in the sense of such similarity in course and phenomena as to make it proper to class them together for the convenience of description and study. Between the cases commonly called scrofulous, and those called tuberculous, there are many points of similarity, and there are others of difference; while there are other cases still, that combine the similarities and differences together, both in origin and cause, in phenomena and results.

Rickets, by some, is regarded as a variety of scrofula, and it has indeed resemblances to scrofula, but it has differences so marked as to entitle it to be classed as distinct, and it will be excluded from the present consideration.

Cases are frequently met with, especially in children and youth, of a constitutional defect, where there is feebleness, irregularity of organization, and where the operation of the life-force is of a peculiar character. This condition is often hereditary, or at least congenital; but it is not unfrequently acquired by unfavorable life-conditions. In this state there is a *tendency* to a variety of morbid actions, especially to slow inflammatory processes during childhood; and after puberty, in early adult life, to pulmonary phthisis and a comparatively early death. Such cases are in the aggregate generally called scrofulous or strumous. If specific consumption occurs, or if there is a peculiar deposit or formation in the lungs, the serous membranes, or other parts, of an albuminous material of low vitality which is incapable of vascular organization, a material containing irregular-shaped and some very large cells (giant cells), and which sooner or later loses its vitality entirely and softens and decays, the name of *tubercle* is applied to the deposit or formation, and the individual suffering from such a state is said to be *tuberculous*, or to be affected with *tuberculosis.*

In most conditions of permanent lowered vitality, from whatever cause, this low-lived, bioplastic, tuberculous material is more likely to occur than in persons of vigorous life-force; and those who are called strumous are more liable to tubercle than those that are well-formed, healthy, and free from that condition. But these persons who may thus be more or less inclined to tubercle, if reaching the period of adolescence, vary much during childhood in the particular conditions presented.

Some have the nervous system highly developed, the mind and body active, are often remarkably precocious in intellect and character, with slender figures, the fatty tissue rather deficient, the skin thin and delicate, complexion clear, veins distinct; they blush readily; the eyes are bright, pupils wide, eyelashes long, hair silken, face oval, are good looking and interesting; the ends of the long bones not large, and the shafts thin and firm, with limbs straight; and they cut teeth, run alone, and talk early. They have large, but not excessively large, brains, narrow chests, the scapulæ stand out like budding wings, which the prophetic and sentimental say will be angel's pinions soon, to carry them away. They talk philosophy and sentiment in the nursery, almost in the cradle; they are considered "too smart to live," and are excellent subjects for Sunday-school story-books. The leading pathological tendencies are to fatty degeneration of the liver and kidneys, and particularly to miliary tubercular deposits or formations and their consequences in serous membranes, and sometimes to tubercle in the lungs in larger masses and of the yellow variety. These deposits cause, or at least are associated with, a peculiar form of inflammation, producing what are called tubercular meningitis, tubercular peritonitis, tubercular pleuritis, or pulmonary consumption, or tuberculosis, according to the seat and course of the local disease.

Should these children escape the dangers and survive the period of childhood, there is the strongest tendency to early phthisis; and if they escape consumption, the early promises of their precocious intellects and characters are not usually realized.

Other cases present very different phenomena. The temperament is phlegmatic, the mind and body are sluggish, the figure is heavy, the skin thick and opaque, the complexion dull and pasty looking; the upper lip and alæ of the nose are thick, the lip is sometimes fissured, and the nostrils are expanded. The lymphatic glands are enlarged and perceptible to the touch, often constantly and markedly so; the abdomen is full and protuberant; the ends of the long bones are rather large, and the shafts thick. The size of the body varies—it may be stunted or almost gigantic, but flabby and feeble—tall and loose rather than broad and firm, and the cartilages are enlarged. The bones may have a deficiency of mineral matter and be comparatively soft, but not as distinctly so as in rickets. Dentition is tardy, the teeth are imperfect in form, and apt to decay early. The head may be misshapen, from softness of the bones and the gravity of the brain: the brain may be either too large or too small—when large it is deficient in quality and is liable to be affected by effusions from vascular debility.

The leading pathological tendencies here are to inflammation of the mucous membrane of a peculiar and persistent kind; to strumous ophthalmia; to inflammation of the tarsi; to catarrhal inflammation of the mucous membrane of the nose, pharynx, bronchi, stomach, and intestines; to obstinate diseases of the skin, depositive, suppurative, or effusive; to catarrh of the ears—otorrhœa; to caries of the bones; to chronic inflammation of the joints, and particularly to enlargement and induration of these parts, and on the slightest occasion to inflammation and suppuration of the lymphatic glands.

Besides these more typical forms of diathetic conditions, cases are met with where various manifestations of the elements described as belonging to these different classes are combined in the same individual. A bright intellect and delicate skin may occur in connection with enlarged glands and diseased joints, etc.

Now all these cases of both classes or varieties are, by some authors of high authority, called strumous or scrofulous; while others, as does Sir William Jenner, call the first class of cases tuberculous, and the second scrofulous, regarding them as pathologically distinct. Dr. Jenner says they are distinct, because the general condition of each is perfectly different; because the pathological tendencies are different; because we seldom see the subjects of one also subjects of the other; (?) because tuberculosis, being unquestionably hereditary, we do not find the children of phthisical parents specially prone to scrofulosis; and because the course, prognosis, and treatment of each of the diatheses are different.

But notwithstanding these arguments, which must be regarded as having much force, there are similarities between the two classes of cases. An inflammation which may be easily excited in either takes on a peculiar and obstinate form. A slight injury of the hip-joint in any of these cases is liable to produce coxalgia; an inflammation of the lungs is likely to terminate in phthisis, etc.; and it is only a question of words, of the meaning of terms, whether they shall be regarded as varieties of one disease or tendency, or as distinct affections.

Two varieties of pathological action in the same system are not likely to go on with as much activity as one alone; and when there exists, as sometimes is the fact, tuberculosis of the lungs and inflammation and suppuration of external glands, the latter condition appears to retard the progress of the former: but this proves neither identity nor distinctness of the character of the two processes. It, however, suggests the propriety of counter-irritation by setons or issues in diseases of the kind.

The words scrofula and struma are used by many in a very loose and general sense, as indicating almost any general chronic or lowered condition of vitality, even when arising directly from some unfavorable local, even temporary, hygienic conditions; and though this is a wrong use of the terms, it is not without its apology, as any long-continued lowered condition is apt to lead to diseases of a strumous or tubercular character.

Both the scrofulous and the tubercular tendencies are transmissible, as are all constitutional and long-continued conditions. But this subject of *heredity* will be referred to in another connection, when it will be considered more in detail, and the practical conclusions to be drawn from the facts will be pointed out.

At present we are more particularly concerned in understanding that modification of the inflammatory process which occurs in persons called strumous and tuberculous, or who have actual strumous and tuberculous diseases going on in the body.

As already stated, in these conditions, and particularly that variety which is more properly called the strumous or scrofulous state, there is an abnormal susceptibility of certain tissues to injury, and a peculiarity in the products and the course of the inflammation which the injury induces. This susceptibility, though general, is commonly most marked in the lymphatic glands and in the mucous membranes, although the skin, bones, and joints are frequently the seats of these peculiar inflammations. In some cases one, and in others another part, has the greater morbid susceptibility.

When inflammation in any of these cases occurs, it tends to be exceedingly protracted, though it may commence in an acute form. It is frequently, however, chronic from the beginning, in some cases coming on almost imperceptibly; and when abated or subdued it is very readily reinduced. Ordinary inflammation in a healthy person has its products readily absorbed if terminating in resolution; or if not, it goes on to suppuration, or to the formation of vascular fibro-nucleated tissue. In scrofulous and tuberculous inflammations the absorption of the inflammatory products is very much less readily effected; they generally infiltrate the tissues and accumulate in them, interfere with circulation, produce irritation in the part, and lead to retrogressive changes of various kinds; and often the morbid exudates, mingling with changed tissues, result in what is called *caseous* degeneration. In the more strictly tuberculous cases the exudates tend to the formation of [illegible] tubercles. In these deposits or products there is little or no tendency to the development of new blood-vessels [illegible] tuberculous matter—[illegible] Inflammation, however, may [illegible] with the results [illegible] tumors with vessels [illegible] been proved, and the [illegible] healthy pus—the [illegible]. Still there are some exceptions to the slowness of the processes. Sometimes in these glands, as about the neck, the infiltration and swelling are very rapid ; and sometimes, especially in children apparently strumous, the swelling as speedily disappears. But these are exceptional, though in many cases the amount of swelling in the strumous glands fluctuates remarkably within a few hours. These peculiarities of inflammation in scrofulous and tuberculous cases are due to the peculiar condition of lowered and perverted vitality; and these conditions modify not only the general course, but the histology of the process and its products. These products are more cellular than in ordinary inflammation ; there is not so much fibrinous material ; the proliferating processes in the tissues are less, and the bioplasms produced are of a lower grade of vitality and organizing power. Recent observations have shown, as already intimated, that many of the cells are much larger than those ordinarily produced as the result of inflammation. In tubercle particularly—which certainly must be considered as having close relations to the products of scrofulous inflammation, some of high authority regarding the materials as essentially identical—the existence of these large cell-forms is almost constant.

These histological peculiarities of the products of scrofulous and tuberculous inflammations, and the peculiar vital state of the tissues of scrofulous and strumous subjects, lead to peculiar infiltrations, and in the parenchyma of organs, as in glands and viscera, cause obstruction of vessels so as to interfere with nutrition, and lead to the metamorphoses resulting in scrofulous and tubercular degenerations, and to the ulceration and necrotic processes in the various diseases coming under the heads of scrofulosis and tuberculosis, of joint diseases, phthisis, etc.

The management of strumous and tuberculous patients and diseases will be considered in connection with the subject of phthisis.

It has been already shown that inflammation produces more or less destruction of minute particles of the inflamed part, in its ordinary course, and not unfrequently more appreciable local death by the processes of ulceration and gangrene.

Unfortunately, it also often produces somatic or systemic death. All that live must die, and when death comes in the course of nature, from the normal exhaustion of the vital force, or as the fruit ripens and falls to the earth, the physician can only observe the process : and to give advice as to the proper life conditions is all that he can do. Any attempt to interfere with drugs or any unnatural excitants or depressants will but hasten the event, and convert an euthanasia into a premature or violent death. The opinion that "wine is the milk of old age," the opinion that so unnatural an article as alcohol can serve as a condition of normal life in old age as milk does in infancy, is as far from the truth as anything else that is false; and a belief in it has done much harm. Those who have regarded this article as useful in the exhaustion of age have inferred its usefulness to sustain healthy vigor at all ages; and the acting upon that belief has resulted in the cultivation of tastes and the establishment of habits which have been transmitted through generations, involving nations and races, and has produced false beliefs and wrong practices, with the disastrous results of which the world is too familiar. Alcohol, like other drugs, may modify beneficially morbid actions, but, like them, it is incapable of increasing or sustaining healthy ones. The opinion is now becoming general in all enlightened medical circles, that alcohol in all its admixtures should be regarded, from a scientific point of view, as a medicine or a poison, according to the manner of its use, and should be classed with other drugs.

Dr. D. C. O'Connor, of Cork, in a presidential address to the British Medical Association, says: "Happily the timely declaration of two hundred and sixty of the most eminent physicians of London —which might be printed in letters of gold—has placed this question on its true basis; stating that while unable to abandon the use of alcohol in some diseases, no medical practitioner should prescribe it without a sense of grave responsibility, and with as much care as any powerful drug."

But death from inflammation is premature, and when threatened requires the skill of the physician to avert it if possible. Inflammation may cause death in a variety of ways—from arresting the functions of various organs involved in the primary disease, by the severity of the fever induced, or by the shock to the system from the extent or severity of the inflammatory process—or death may occur from exhaustion from its long continuance or its excessive exudations. But, as long ago shown by Bichat, the immediate support of life is a tripod, the branches of which are the brain, the heart, and the lungs. Other organs and their functions are essential to any considerable continuance of life; but the functions of the stomach, the kidneys, or the liver might be suspended for some time without death occurring. If, however, the brain, the heart, or the lungs should cease to act for a very short time, nutrition would cease, which is death. Whatever the remoter causes, the immediate approach of death is by one or the other of these organs. As a rule, certainly, one or the other of these tends first to cease its action.

Death beginning at the brain is called coma; that at the heart, when sudden, is called syncope, and when more slow, asthenia; and that at the lungs, asphyxia, or, more properly, apnœa.

Death from the brain may be by local disease of that organ, by pressure upon it, by arrest of the circulation to or from it, by blood poisoning as in uræmia, or by excessive heat as in sunstroke or hyperpyrexia.

The heart may cease either from paralysis or spasm produced by defective or irregular innervation, or by organic diseases of its structure. Chloroform or veratrum viride, when causing death by the heart, paralyzes it; digitalis causes tonic spasm—both equally arresting circulation. The heart also sometimes ceases from shock, from the excessive heat of fever, and from the formation of coagula within it. Asthenia is a common mode of death, the heart gradually failing from protracted shock or exhausting or disorganizing disease.

The lungs may cease their functions from exclusion of air, as in croup or other obstructive diseases in the air-passages; from effusions of fluid or the entrance of air into the cavity of the pleura; from filling up of the lung substance by inflammatory or dropsical effusions; by wasting of the lung substance; or by failure of innervation of the apparatus of the respiratory movement. In these and other modes the functions of these respective organs may be arrested, and frequently the same or various causes act upon more than one of them at a time. To prevent inflammation, wherever situated, from causing death, its course, if possible, must be arrested, or its severity abated; but besides the means to that end, the different functions tending to cease must be kept in operation as long as possible by whatever measures may contribute to that end. Thus if the brain is ceasing to act from pressure or the poison of urea, the pressure should be removed, or the urea eliminated from the blood. If the heart should be ceasing its action from shock or inanition, the shock should be abated, nutriment should be supplied, and cardiac stimulants should be administered. Here drugs may be of service, and those which sound physiological and therapeutical principles point out, and which discrimination, observation, and experience sanction, should be resorted to. These measures may include the use of alcohol, opium, ammonia, camphor, and other agents. That opium, alcohol, ether, and other neurotic agents often diminish shock, and thus indirectly sustain the heart's action, there can be no doubt. That they directly excite it to increased action is much more doubtful. That alcohol does so is believed by many; but its efficacy in that respect has been much overrated, and further and more scientific and discriminative observations are needed to establish its true power. In health the sphygmograph does not show it to increase the heart's force, and when it increases it in disease, it must be presumed to do so indirectly, by relieving shock or modifying some diseased process. Similarly the lungs must receive attention when their functions are tending first to cease. To "obviate the tendency to death," which is among the objects of medicine in all cases, becomes the special duty of the physician when that event is immediately threatening; and he must then consider the method of its approach, in order to do what is possible to stay it.

NON-INFLAMMATORY CHANGES.

There are various other processes and products, the result of changes of nutrition, not necessarily inflammatory, which would naturally be considered in this connection in a full and systematic work on pathology. Those conditions belonging to medical cases will be described in connection with the diseases of which they constitute a part.

The subject of tumors is generally considered as surgical. Tumors are modified tissue growths, varying in the amount and character of their vital endowment, and having different histories and results. They have been variously classified, according to their structures and courses, the tissues from which they spring, and which they resemble. The following *classification*, copied from "Green's Pathology," will give an idea of their formation and something of their characteristics:

I. Type of the fully developed Connective Tissues.

Type of	Fibrous Tissue	Fibroma.
"	Adipose "	Lipoma.
"	Cartilage	Enchondroma.
"	Bone	Osteoma.
"	Mucous Tissue	Myxoma.
"	Lymphatic Tissue	Lymphoma.
	inducing the disease,	Leucæmia.

II. Type of Higher Tissues.

Type of	Muscle	Myoma.
"	Nerve	Neuroma.
"	Blood-vessels	Angioma.
"	Papillæ of Skin or Mucous Membrane	Papilloma.
"	Secreting Glands	Adenoma.

III. Type of Embryonic Connective Tissue.

The Sarcoma.

Spindle-celled Sarcoma
- Small spindle-celled Sarcoma.
- Large " "
- Osteoid " "
- Melanotic " "

Round-celled Sarcoma
- Gliomata.
- Alveolar Sarcoma.

Myeloid Sarcoma.

IV. The Carcinomata.
- Scirrhus.
- Encephaloid.
- Colloid.
- Epitheliomata—Adenoid Cancer.

V. Cystic Tumors.
- Cysts.

Those tumors which appear in internal organs and present prominent symptoms, coming under the care of the physician, such as cancer of the stomach, will be described in their proper connections.

Syphilis, with its local and constitutional effects, is also regarded as belonging to surgery; it, however, frequently complicates medical cases, and its gummata and other changes often occur in internal organs. It is a subject requiring attention from both the physician and surgeon, but, as it is usually elaborately dealt with in works on surgery, it will be omitted here.

THERAPEUTICS OF INFLAMMATION.

Before proceeding to the consideration of particular diseases, it is judged proper to make some suggestions respecting therapeutical principles and measures, and to discuss, with some particularity and detail, the principles of the treatment of inflammation.

The ultimate object of all medical science and medical study is the prevention, the alleviation, and cure of diseases, or the care and treatment of persons threatened with or affected by disease. While it is impossible for the most skeptical to doubt the efficacy of hygienic and prophylactic measures, curative therapeutics has failed to secure universal confidence. There are very great differences of opinion as to the curative power of medicines, ranging from the greatest confidence in many specifics, to a disbelief in the efficacy of nearly all forms of internal medication. The truth here, as in so many other cases, is to be found in a mean. The skepticism which a few years ago so much prevailed, especially on the Continent of Europe, has yielded, in some instances, to a confidence in positive and heroic measures, which has perhaps gone to the other extreme. But whether through past skepticism or the intrinsic difficulties of the subject, therapeutics has not kept pace with other branches of medicine. The *science* of medicine in the progress of general science, and by the present and prospective means of investigation, promises in the early future to arrive at a degree of perfection which will be most gratifying to the lovers of truth; but there are difficulties in the way of the art of healing which must delay longer the full fruition of the hopes of those most solicitous for the speedy and certain cure of diseases.

To arrive at the truth respecting many of the normal and abnormal actions of the system, however minute the structures and obscure the processes involved (with the aid of the microscope and chemical reagents, and all the other modern means of scientific observation), only close observation and patient care are requisite to realize many positive and immediately satisfactory results. Other qualities are required for coming at just conclusions respecting the curative power of therapeutical agents amid the more complicated problems, and the more numerous sources of error involved in these investigations. More patience, a larger number of facts, more knowledge of logical processes, greater ability to sift and weigh evidence, to detect fallacies and exclude errors, are required here than in simple physiological and pathological inquiries. There must be observation, experience, and comparison on a large scale, and for no limited time, to entitle one to an independent opinion upon questions so difficult as those of determining how much is due to the influence of medicine, and how much to the natural powers of the system and the natural tendencies of diseases toward recovery or death in the multifarious cases which occur. A judicial faculty of the highest order is needed here, to come to just opinions upon general questions of therapeutics; and in the practical management of individual cases, other faculties still are required: quick and discriminative observation, the power of drawing ready inferences, the command of resources, their energetic yet judicious application, unwearied attention to minute details, and loving devotion to the work, are all essential in the most successful practitioner of medicine.

Buckle says: "The philosophic pathologist is as different from a physician as a jurist is from an advocate, or an agricultural chemist from a farmer. The two sets of faculties may be united, as they occasionally are, but they are not always so." To many persons the bench is more attractive than the bar, though not to those of the highest skill; and so are experiments in the laboratory more attractive than the labor in the field, though perhaps not to those of the greatest physical energy. But it is the advocate that wins cases, and sometimes protects accused innocence and secures justice; and it is the farmer whose labor feeds the hungry and sustains the nation. The laboratory and the chemist would be useless if the farmer did not apply the knowledge and cultivate the fields.

Similarly, the knowledge of the pathologist would be practically useless, if the physician did not transform the science into art, and apply the knowledge of pathological conditions and the actions of therapeutical agents to the relief of sufferings and the prevention and cure of disease. While careful to lay as good a foundation as possible in correct general principles, and in the exact pathological knowledge of the present day, it will be the chief aim of the present work to teach the student, and express to the practitioner, what is reliably known as to the best methods of distinguishing and treating the diseases which engage the daily attention and anxious care of the laborious physician.

While giving due heed to the views of others, derived from the numerous sources of different countries and localities, of country and city, of private and hospital practice, the individual views of the writer will be freely, though it is hoped cautiously expressed, based upon a careful weighing of evidence and a long experience in the common as well as in the more rare cases of disease.

In the uncertainty still existing in the "final and supreme stage—the stage of therapeutics"—and the changes of opinion based upon new discoveries and larger observations which so rapidly occur, it requires some boldness to commit one's self on various subjects whose aspects are so likely soon to change; but such committal is inevitable in the production of a work of any value, and if views that will be expressed are proved to be erroneous, they will only share the fate of very many others, even from the highest sources in the past. Views will be expressed with much confidence and positiveness, based upon observation and experience deemed sufficient to establish their correctness, though they may be quite different from those generally held by the profession, and different from those acquiesced in by the writer but a few years since. Better methods may be found in the future; but most of the means that will be recommended, he ventures to assert, cannot be found to be useless. But whatever be the fate of any views expressed, they will be the result of what appears to him fair deductions from admitted facts and principles, or will be conclusions from sufficient evidence drawn from his own experience, or that of others, to commend them to his judgment as true. An effort will be made to avoid following any loose statement from mere routine authority and custom, as many errors have been handed down from one authority to another, without examining the grounds of evidence, either logical or from carefully observed and authoritatively recorded experience, and without confirmation from personal observation.

Although therapeutics is not yet in a satisfactory condition, many questions of importance remaining unsettled, and many prevalent ideas being, it is believed, quite erroneous, yet great advancement has been made in successful modes of treatment, and still greater, it is hoped, will be made in the early future. Therapeutical measures have much more power over the course of many diseases, when promptly applied in their early stages, than the writings of those who have seen acute cases chiefly in consultation and in hospital practice, and consequently in the stages more or less advanced, would lead us to suppose. The observing and well-informed private practitioner, especially if practicing in the country among a well-to-do population, who sees cases near their onset, has much more confidence in medicines than those who derive their conclusions from practice in large cities and among the inmates of large hospitals.

Among this class of writers, which includes our standard authors, it is quite the fashion to deny the power of therapeutic agents to arrest or materially modify the course or character of most diseases, and to limit their efficacy to the diminution of pain and some other unpleasant symptoms; and it is customary to regard the physician as doing all that can properly be attempted in most instances when he watches the case, places the patient under favorable hygienic conditions, endeavors to abate distressing symptoms, to sustain the strength by food and what are called "stimulants," and thus seeks to enable the system to endure the disease, which, it is supposed, will take its course.

With many the course recommended is that of expectancy, modified, but it is feared far from being improved, by the addition of so-called "support" and "stimulation." It is unfortunately true that we at present know no means of arresting the course of some diseases, such as small-pox, measles, and other similar affections; and in these cases the duty of the physician is like that of a sailor in a storm—to manage his ship as best he may while the storm, which he is powerless to influence, lasts; but all diseases are not of this character. Simple non-specific inflammations do not run a definite and inevitable course; and some specific diseases, depending upon peculiar poisons, as the malarial or ague class, are among the affections most under the control of remedies. Some diseases that usually run a definite course, sometimes spontaneously abort, and we never should cease to hope that means may be discovered to safely arrest their progress. The old remedy for rheumatism was said to be "flannel and six weeks in bed," and that was too often not sufficient. Since the time of Fuller and Garrod this has not been the remedy; and particularly since the very recent era of salicylic acid, rheumatic fever has, in a majority of cases, become a matter of flannel and salicylic acid and a few days, even in some cases of a few hours.

The list of such curable diseases is increasing—it already embraces some of the internal inflammations and fevers, and, it is ardently hoped, may yet embrace them all.

Among the qualities necessary to the best physician is faith. In morals it removes mountains; in science it excites to investigation; in art to effort and progress; in the practice of medicine, when not excessive, it leads to success. The difficulties in the way of therapeutics, which are still great, will never be overcome by that paralysis which a universal skepticism is so sure to produce. But faith, however useful or necessary, must be tempered by a knowledge of the uncertainties and the sources of fallacy which exist. There are fallacies of theory to be detected by experience, and fallacies of limited and imperfect experience to be corrected by scientific facts and analogical reasoning. There are fallacies of substituting a theoretical word for a fact; fallacies of general principles and the systems founded upon them; fallacies of therapeutical principles; fallacies in the indefinite use of terms or in their being used differently by different persons; and, above all, at least as most common, fallacies in investigating the relations of cause and effect. One event succeeding another does not always stand in relation to the preceding event as an effect—the relation of cause and effect may be absent—and this may be the case even when the first event has been brought about for the purpose of producing a result the same as that which has occurred. A medicine may be given to abate a fever, the fever in due time may subside, but from some other cause than that of the medicine. Fevers subside, and sometimes suddenly, when no medicine has been given, or even when medicines have been given that would tend to increase fever—the fever abating in spite of the medicine, though some medicines undoubtedly abate and arrest some febrile states. There are various compound fallacies arising from incorrect statements, from regarding as facts opinions which are unsupported, and at the same time from deriving illogical conclusions from unsound premises. One may make the most positive and the most conscientious statement that he was cured of a particular disease by a particular remedy. Such a statement is often accepted as a fact. But instead of its being a single fact, it is an expression of three opinions, either of which may be untrue. In the first place, the patient may never have had the disease as stated; in the next place, he may not have been cured, the disease, whatever it was, may still be existing; and in the third place, supposing the disease to have been present and removed, the remedy in question may have had nothing to do in its removal. It may have been a mistake and a fallacy from beginning to end. The certified cancer cures are illustrations, and all the false systems and useless nostrums are sustained by just such alleged facts. All these and other sources of fallacy must be considered and guarded against. They are sufficient to make the art in many respects conjectural rather than positive, to compel us to proceed upon probabilities rather than certainties; but we may remember that in other things as well as in medicine "probabilities are the guide of life."

With regard to the law, which has been eulogized as the "perfection of human wisdom," even its "delays" are not as conspicuous as its uncertainties. And in politics, finance, and commerce, in all the affairs of secular life, not to mention philosophy, metaphysics, and theology, conjecture and uncertainty abound, and often something less than probability is the only guide to follow.

In medicine, well observed cases sufficiently numerous will bring us to as much certainty as can be arrived at in any other profession or the affairs of our uncertain life. Deductions from scientific facts, corroborated by sufficient and well observed experience, will justify positive expressions of opinions at least, and such opinions, though they may not be regarded as conclusive, must be accepted at their estimated value. This, and nothing more, is asked for the opinions which may here be expressed. As already intimated, the duty of the physician is not limited to the treatment of diseases already occurring, but to their prevention as well; and his practical work is comprised under three heads of Hygienic, Prophylactic, and Remedial Treatment.

Hygiene is the science of Health—the knowledge of those conditions on which the preservation of health depends. It embraces the laws of health relating to the Individual, the Family, and the Public; to the relation of the Sexes, to the relation of Parents and Offspring; and the laws of health pertaining to the mind as well as to the body. It embraces a knowledge of the conditions of health and the causes of disease, and teaches how to secure the one and avoid the other. But the limits of this work will not allow of a full and systematic discussion of this subject. Sufficient, however, will be said, when treating of particular diseases, to keep in mind the importance of the subject, and to give an idea of some of the means necessary for the accomplishment of its great objects.

Prophylaxis signifies the more special preventive treatment of particular diseases.

In some respects it may be regarded as a part of hygiene, and in others as remedial treatment.

In many cases there is a tendency, inherited or acquired, to particular forms of disease. The means to be used to prevent the development of such tendency would come under this head.

The special measures to prevent the occurrence of parasitic infections and endemic diseases, and the means to prevent the complications and sequelæ attending or following particular primary affections, are also prophylactic. These matters will be considered in connection with the particular diseases.

The Remedial Treatment of cases of disease engrosses most of the time and constitute, the chief labor of a large majority of physicians.

In undertaking a case the objects are:

1. To ascertain the existing morbid condition—to make a Nosological Diagnosis.
2. To ascertain the pre-existing morbid conditions, latent or apparent, and the causes which have produced the present state—to make, as some have designated it, an Etiological Diagnosis.
3. It is well next to consider the probable course and termination of the disease—to form, though it is not always necessary to express, a Prognosis.
4. Next to formulate in the mind an indication—to consider definitely the particular object or special change of the morbid condition to be accomplished by treatment. This may be called the Therapeutical Diagnosis.
5. And lastly, to determine, select, and apply the remedies believed to be indicated, to consider their mode of operation, and undertake the general direction of all the conditions bearing upon the case.

Under this head will be comprised not only the medicines to be prescribed, avoided, or discontinued, but all the surroundings—the diet and regimen, the hygienic management as well. The attainment of the first and second objects will require the inspection of the patient, the observation and interpretation of all the apparent characteristics of the person and the disease; the listening to the patient's statement of his complaint, and generally the eliciting of further facts by appropriate questions; the ascertaining of the temperature; the physical exploration often of the various viscera; and the microscopical and chemical investigation of the secretions and morbid products.

The third object will require a knowledge of the history of similar diseases, a judgment as to the tendencies and powers of endurance of the system, and the influence which treatment may exert on the case.

To accomplish understandingly, rationally, and properly the third and fourth objects, a knowledge is required of the particular pathological condition, the morbid changes—physical, chemical, and vital—which are going on, the manner in which these changes are being accomplished, the causes which are keeping them in operation, the conditions of all the organs and functions of the body, as well as the part particularly affected, so as to form a judgment of what treatment can be borne, as well as that which is indicated by the special disease. It is important also to know the action and power of the different medicines, physiological and therapeutical, not only upon the particular diseased processes for which they may be prescribed, but upon all the organs and functions of the body, immediate and remote, primary and secondary; or, as some make the distinction, of the "drug effect" and the therapeutical action, and then to form a judgment and give explicit directions as to the quantity, time, and manner of using them. The idiosyncrasies of the patient, if he has any, must be taken into the account, and his confidence, if possible, must be secured. In many cases no less knowledge and skill will be required in directing, respecting the hygienic or dietetic conditions, the food and regimen, than about the medicines, and, in some cases especially, these matters must not be left to the caprices of patients, ignorant nurses, or friends, however solicitous.

It may not be possible to have all this knowledge indicated; indeed, in the present state of the science and art, many things must be left to conjecture and uncertainty; but this full knowledge should be the aim of every physician, and should be approached as nearly as possible.

Pathology, in its practical uses, is the Science of Indications; and in the fulfillment of these indications we are not entirely without reliable guides. There is an absolute constancy in the laws which regulate life; and there is "a strict subordination of phenomena to certain conditions, which [however] have to be determined."—(*Raynaud.*) There are differences of susceptibility to the action of agencies, pathological and therapeutical, and differences in the forces of the system in their tendency to restore normal actions; and these cannot always be foretold. Hence the uncertainties of therapeutics, even when pathological states are determined.

The indications, the remedies, and the management will vary not only in different diseases, but in the variable conditions of each case, and, from the statement made, it can but be seen that, in the practice of the profession, there is opportunity and need for the exercise of the highest judgment, the most exquisite tact, and the greatest skill.

The therapeutic agents, embracing the articles of the Materia Medica, are arranged variously for the convenience of study, and according to one or more of their leading properties. They may act by destroying the cause of a disease, by modifying the condition and function of some system, or organ, or part; or they may act more directly upon the complex phenomena in some specific manner which we do not understand. Some of these so-called specifics act upon some physiological factor, or some special modified action, rather than upon the aggregate phenomena. It is now well known that certain medicines or poisons antidote or counteract the effects of others, either by exerting an opposite influence upon the same organ or function, or by playing off one function against another. The antagonism of atropia and morphia is an example. This suggests a similar force of drugs in reference to morbid actions produced by other causes, and constituting particular diseases. These facts and considerations, especially the antagonism of diseases and remedies, the result of modern discovery, should suppress unreasonable skepticism and give courage and hope.

With reference to the therapeutical indications they fulfill, medicines have been classed under the heads of—

1. Anodynes—agents which relieve pain. Often the same articles are soporifics or anæsthetics—articles which induce sleep or destroy sensibility.
2. Protectives—articles which shield, usually mechanically, from irritating influences.
3. Balancive agents—means which influence the proportions or balancing of activities—sensitive, motor, circulatory, nutritive, or secretory—embracing revulsives or counter-irritants, local depressants, special stimulants, etc.
4. Economics—agents which diminish waste and save the tissues and powers of the system.
5. Eliminatives—agents which carry out of the system, or eliminate through the emunctories or excreting organs, effete or injurious matters.
6. Antidotes—articles which neutralize, destroy, or prevent the effects of poisons.
7. Alteratives—in its broadest sense embracing a very large number of articles—agents which change actions beneficially, by whatever means or in whatever way; in a more restricted sense, agents which change actions without producing sensible evacuations.
8. Recuperatives—agents which increase or sustain power, or restore to the system something it needs—embracing tonics, stimulants, nutrient and chemical elements which restore to the system vigor and strength.
9. Sedatives—agents which diminish action, general or local.

Under these general headings may be made many more subdivisions, as, for example, under the head of Eliminatives would come Cathartics, Diuretics, Diaphoretics, Cholagogues, etc. The details are the subjects of works on Materia Medica and Therapeutics. The terms which have here been given as designating the general classes of agents will be those chiefly used in the therapeutical directions which are to follow.

The **Pulse**, as a means of determining the existence and character of an inflammation and its accompanying fever, and as furnishing therapeutical indications, is worthy of careful attention, and some statements respecting it may here be made.

Since the fever thermometer has come into such general use, and the sphygmograph has promised to reveal with more precision the force and character of the cardiac and arterial contractions, less attention has been given to conditions of the pulse discovered by the fingers of the physician; and the *tactus eruditus* in pulse-feeling, once so much cultivated, has been neglected. Though the fever thermometer is now in almost every physician's pocket, and its daily use is of great advantage in diagnosis and in furnishing therapeutical indications, a sphygmograph is possessed by few, the method of its use is not generally understood, and it is very seldom brought into requisition in the sick room; and the inconveniences of its use will prevent its being a common instrument in the hands of the general practitioner in the daily rounds of his common work.

In the practice of blood-letting, so common fifty years ago, the fact of the presence of inflammation was sufficient, in the estimation of many, to call for this remedy in one form or another; but the pulse was consulted to determine the mode, whether general or local, and the extent to which it was to be carried. With the comparative abandonment of this method of depletion, the importance of so closely watching the pulse may have diminished; but its conditions still furnish important indications of morbid processes, and of the means of correcting them, and particularly of the vital activity and the power of endurance of the patient. The conditions of the pulse and the common manner of observing them should be studied.

In observing the pulse three points should be kept in view—the moving, propelling force of the heart, the motion of the blood, and the state of the artery. The physiology of the circulation is supposed to be understood by the reader, but a few points may be referred to as a basis of its pathology.

These conditions have their normal standards, but they are varied physiologically, and are still more varied in disease.

The pulse varies in frequency of beat by age. The pulse of the new-born infant is from about 130 to 140 beats per minute; at one year of age 110 to 120; two years, 100 to 110; three years, 95 to 105; four years, 90 to 100; at puberty, 80 to 90; manhood, 70 to 75; vigorous old age, 70 to 75; decrepitude, from 75 to 80. The pulse in women is from 6 to 12 beats faster than in men, and in warm climates it is more rapid than in cold. Temperature has a marked effect upon the frequency of the pulse. If a fluid of different temperatures be thrown through a separated heart still possessed of vital excitability, the frequency of the pulsations rises and falls in proportion to the temperature, unless the temperature be excessive, when the irritability is completely destroyed. In disease, the fever heat increases the frequency of the pulse; but various other circumstances influence its motions. Generally in the adult when the temperature of the body is 37° Centigrade or 98.5° Fahrenheit, the pulse is 78.6; when 38° Centigrade or 100° Fahrenheit, it is 88.0; when 39° Centigrade or 102.3° Fahrenheit, it is 97; when 40° Centigrade or 104° Fahrenheit, it is 105; when 41° Centigrade or 106° Fahrenheit, it is 110; when 42° Centigrade or 108° Fahrenheit, it is 122. An increase of 2° Fahrenheit, on an average, increases the pulse eight beats. The condition of the nervous system, physical or mental excitement, the position of the body, lying, sitting, or standing, the degree of weakness or strength, as well as age and sex, vary its frequency. Between lying down and standing the pulse varies from five to twelve beats in health, and the erect position often increases it much more in disease.

In examining the pulse we observe not only its time, but its force, equality, size, hardness, and various other qualities. We judge of the state of the heart, the volume of the blood, and the condition of the artery.

The terms strong, weak, sharp, jarring, rapid, quick, slow, unequal, intermitting, and fluttering, indicate the character of the impulsion of the heart. The words full, large, and small, have reference to the volume of the blood flowing through the artery. The terms hard, soft, contracted, open, and chorded, have reference chiefly to the state of the artery. The terms thready, gassy, firm, and tense, have reference to the force of the heart, the volume of blood, and the state of the artery together.

The experienced observer distinguishes by the finger whether the artery fills slowly or gradually—whether the pulse is thus quick or tardy in each individual movement; he notices how high the pulse wave is—the largeness or smallness of the pulse; how widely the artery is distended—its fullness or its vacancy; in what degree of tension is the artery—its hardness or its softness; and whether the artery fills evenly or irregularly, producing a vibratory and sharp, or smooth and rounded pulse.

The active fever pulse of a previously healthy adult is more or less large, full, hard, and quick, as well as rapid; and it gains these properties chiefly by the influence of a quicker and stronger contraction of the heart. In pneumonia and other acute inflammatory fevers this characteristic pulse is often observed. But in an advanced stage of such diseases, and sometimes in the early stages, there may be a small, empty, and soft pulse, one that is thready, scarcely perceptible, and at length absent at the wrist. The changes in the heart beats; changes in the resistance at the extremities of the vessels due to variations in the calibres of the small arteries, caused by the contraction of their muscular coats, in the arteries of particular points or of the system at large; and changes in peripheral resistance to the flow of blood through the capillaries, due to alterations in the adhesiveness of the walls, or the relations—the attractions—of the blood and tissues, such as occurs in inflammation; and changes in the quantity of blood in circulation, will all vary the characters of the pulse. Most of these conditions are under the influence of the nervous system—the exciting and inhibitory nerves—and through the action of this system chiefly an organ has more blood carried to it when at work than when at rest, and in inflammation than when in health. The vital endowments of the tissues, however, exert an influence, and all these conspire to vary the circulation and the pulse.

When the blood pressure is high, from obstruction to its free flow in the small arteries and capillaries, there is more resistance to the contraction of the ventricle, and the heart's work is increased. The contractile energy of the heart becomes greater, and the blood is thrown into the arteries with more force, giving hardness and tenseness to the pulse. The increase of blood pressure, however, does not increase the frequency of the beat. On the contrary, it has been stated that "the rate of the beat is in inverse ratio to the arterial pressure." This, however, is not always the case, and when the vagus is disturbed in its function, and probably in other disturbances of the nervous system, the results are varied, and no positive rule without exceptions can be established.

These statements are intended to show some of the means by which the pulse is varied, and to give an understanding of some of the indications of differences in its beats.

A rapid pulse may indicate a feverish increase of temperature, or a low grade of blood pressure—a deficiency of that fluid—or it may indicate a morbid irritability of the heart or of the nervous system. It does not of itself indicate an increased quantity of blood or the sthenic action of the heart, and is not an indication, even according to the depleting system, of lowering treatment.

When the pulse is comparatively slow, but full, firm, and hard, the blood pressure is great, either from obstruction at the vascular periphery, or from a large quantity of blood in the system, or from a sthenic excitement of the heart. In such cases cardiac sedatives may be useful, and depleting measures can be borne.

There are, however, complicated circumstances, giving to the pulse a great variety of characteristics, more even than those that have been named.

There may be presented a full, slow, vigorous stroke of the artery; a full, tense, and frequent pulse; a hard, incompressible, quick pulse, feeling like a tightly drawn cord; a soft, open, compressible pulse; a small, rapid, and weak pulse; and a creeping, soft pulse.

After a copious loss of blood the pulse often becomes vibratory, rapid, and thrilling, causing the sensitive and appreciative finger to tingle, almost as from a galvanic current. This indicates supporting measures.

The indications which many of the different kinds of pulse afford will be mentioned in connection with the diseases in which they are observed.

In examining the pulse some practical rules should be observed.

In an acute disease the patient should lie in a recumbent position, and when comparisons are to be made, he should lie in the same position at each examination.

The mind of the patient should be calm, and free from emotional agitation or excitement, and the body should be at rest.

In feeling the pulse three or four fingers should be applied to the radial artery in front of the wrist. After observing the frequency, the fingers should be pressed on the proximal part of the artery felt, and by the finger at the more distant part it is ascertained whether the flow of blood is interrupted, and by the first fingers it is ascertained how much force is required to interrupt the flow.

There should be no pressure on the course of the artery above by the dress or other means. The size, the hardness, the quality in all the respects named should be observed with a light pressure, but sufficient to obtain a distinct impression of the qualities to be noticed.

Both wrists should be examined, and when any unusual distribution of the radial arteries is present, other arteries, as the carotid, or the temporal, should be explored.

Often the hand, the ear, or a stethoscope should be applied to the chest to observe the force of the heart's beat against the ribs, as well as the force of the blood sent to the arteries.

The pulse in a severe and acute case should be examined more than once at each visit, and its frequency counted by the watch.

The healthy adult male pulse may be described as regular, equal, compressible, moderately full, and swelling slowly and evenly under the finger. In the healthy female and in children, it is not only more frequent, but quicker in each beat and smaller than in the adult male.

In old age the coats of the artery are apt to become firm, and sometimes calcareous, giving a hardness not dependent upon increased force.

There are many peculiarities and idiosyncrasies—some persons in health having a very slow, and others a very rapid pulse.

The natural pulse must be inquired after when unusual conditions or those not in harmony with other symptoms are observed.

Various irregularities of the pulse are observed in diseases of the heart, both organic and functional; and a dicrotic pulse—one which gives a sense of two impulses at each heart contraction—a double wave—is a condition not unfrequent in low forms of fever, with much heart weakness and irritability, or irregularity in its innervation. When such a pulse continues many hours it is an unfavorable indication. When it is followed by an epistaxis, and after that disappears, its indications are not so unfavorable. In some hemorrhagic erethisms it persists to the last, resisting measures to subdue it.

The dicrotic pulse when soft, and when due to the heart's stopping in the midst of its contraction to take a rest, may indicate only weakness, and require supporting measures.

When the dicrotic pulse is *hard,* it indicates a perversion of innervation which may require other means, and it will be either more or less dangerous according to the various circumstances.

A supplementary wave or impulse of the pulse at the wrist has been noticed as resulting from a reaction of the arteries concerned in the palmar arch. It is, however, described by but few authors on the pulse. This recurrent palmar pulse should be distinguished from the small, hesitating, feeble pulse of true adynamia. The palmar recurrent pulse is present in some pulmonary affections, as in the latter stages of severe pneumonia, when the left heart is comparatively empty and the right heart and veins are surcharged with blood. In this condition we sometimes get a distinct recurrent pulse wave, by means of the palmar anastomosis, while in true adynamia this retrograde pulse wave is absent or nearly imperceptible.

A jerking pulse is one which is abrupt, with a projection of the artery which quickly recedes. It is characteristically observed in insufficiency of the aortic valves.

While the pulse is only one of the means of making a diagnosis and forming indications, it is a means of importance, and should receive a proper degree of attention.

These examples are illustrative of the importance of this subject, and will furnish suggestions for its proper study.

The sphygmographic study of the pulse is of interest, and furnishes important indications. It is not entered upon here.

GENERAL PRINCIPLES OF THE TREATMENT OF INFLAMMATION.

It will save time in describing the treatment of particular inflammatory diseases, and give perhaps a clearer understanding of the most important subjects in therapeutics, to consider the principles of treatment of inflammation in general; and in doing so it will serve our purpose best to state the leading elements of this process so far as they may be influenced by treatment, and designate the remedies that may modify beneficially the particular element.

In the description of the inflammatory process it will have been noticed that different elementary actions were present and progressing at the same time, and that some were conflicting in their character. While active hyperæmia is going on in one part, stasis is occurring in another; and while hyperplasia is occurring in some tissues, destructive metamorphosis is going on in others; and while exudation of inflammatory products is being poured out, an absorption of the normal tissue is taking place. In the different stages of an inflammation the prevailing characters of the processes differ greatly, as they also do in different kinds and degrees of the disease.

The different kinds, varieties, degrees, and stages of inflammation, the greater or less predominance of its different elements, and its modifications as it occurs in different persons and in different conditions of the system, will require modifications of treatment. To inquire how inflammation is to be treated, expecting a short and inclusive answer, would be almost as absurd as to expect such answer to the question how a sick man was to be treated.

In this general discussion of the subject the analytical method will be pursued, and principles rather than detailed procedure will be stated, while a more synthetical and detailed method will be adopted when describing the treatment experience has proved most useful in particular inflammations.

It is here assumed that in treating inflammation the object is to arrest its several processes, or at least to bring the whole process to as speedy an end as possible. There may, however, be cases where it would be desirable to promote certain of the inflammatory processes, as that of suppuration where the severity of the inflammation and the amount and character of the exudation showed that the formation of pus would be the most ready method of terminating the whole process; or where a sluggish state supervened after the disease had reached a certain stage, the morbid condition remaining stationary, and when an increase of action involving inflammatory changes would lead to a more speedy cure. Here irritants may be demanded, as in indolent ulcers and in some diseases of the skin. In diphtheritic inflammation, if the suppurative process can be induced, the false membrane is more likely to be thrown off, and the absorption of poisonous matter prevented. These are rather exceptional cases, though they are not unfrequent. Generally each particular process requires to be checked or suppressed, and the suppression of one tends to affect favorably the aggregate.

THE ELEMENTS OF INFLAMMATION AND THE REMEDIES FOR EACH.—LOCAL STATES AND THEIR REMEDIES.

1. **Active Hyperæmia.**—The remedies which may diminish this condition are: Cold steadily applied; water, independent of its temperature, applied for a length of time, diminishes the calibre of the vessels and the circulation in them; position—elevating the part, obtaining the aid of gravitation; evacuants—removing the blood by venesection, leeches, etc., or any of its constituents from the body, as by cathartics, etc.; cardiac and arterial sedatives—diminishing the force with which the blood is sent forth to the part—the "vis a tergo;" derivatives—by which the blood is drawn more to other parts, and thus the amount diminished in that which is inflamed. By evacuants, and, so far as the hyperæmic parts are concerned, by derivatives, the blood is taken from the smaller vessels of the tissues to supply the deficiency in the larger vessels, thus, as has been said, "bleeding the patient into his own vessels." Sedatives to the nervous system, especially to the vaso-motor nerves may diminish the action of the vessels. Poultices act chiefly by the water they contain, and by means of which the water is constantly applied. These means, as will be readily seen, will tend to diminish this condition, and thus diminish one of the elements of the inflammatory process.

2. **Passive Hyperæmia** is another condition. The remedies tending to relieve this are partly the same as those for the more active form, viz.: Evacuants, position, cold, and water. Heat, also, especially when combined with water, is decided in its effect, and produces a similar result on some forms of more active hyperæmia as well; also astringents, stimulants, pressure, and friction. The astringents and stimulants applicable in the passive forms of inflammation, besides diminishing the size of the vessels, produce an alterative effect, changing the character of the action, tending to result in the normal

state. This action is similar to that of mild caustics, and is illustrated in chronic conjunctivitis, pharyngitis, cystitis, etc.

3. For irritation of the nerves, the application of water, of cold, and of heat—sometimes one and sometimes the other of the last two will be best. Narcotics, nerve sedatives, and counter-irritation, sinapisms, blisters, etc., are the more special remedies for this state. The narcotics may be applied locally or used generally, and their great power to control, chiefly through the nervous element, to abate and often arrest inflammation in the early stage, while at the same time they relieve pain and suffering, indicates the influence the nervous system has in causing and modifying inflammatory processes, and the power of therapeutic agents in removing them.

4. The increase of leucocytes in the part, and the increase in their amœboid movements, resulting in exudations and suppurations, are checked by quinine. This appears not only from the direct experiments made upon animals, whose tissues have been observed under the microscope, but it is abundantly confirmed by experience in the treatment of various inflammations with strong suppurative tendencies. The importance of this agent for this purpose, and for counteracting the general phenomena of inflammation, is coming to be recognized. Salicine and salicylic acid perhaps have similar effects, though the facts as to their efficacy in common inflammations have not been so fully established. The control of the latter over acute rheumatic inflammation and fever has been sufficiently proven.

5. For effusions of whatever kinds, serous, etc., when excessive or injurious: Evacuants, derivatives, pressure, and position are applicable as in hyperæmia. Quinine in effusion of leucocytes, spanæmics for excess of fibrine and for fibrinous exudates, as in endocarditis, pericarditis, etc., where organized false membrane is so dangerous; and sorbefacients, as the iodides, etc., where exudates have accrued and require removal. Counter-irritation, iodine locally, etc.

6. For destructive changes, increased metamorphosis and absorption of tissues, all the means which tend to arrest other changes leading to these are applicable; but when these become, or tend to become, the predominant condition, every means should be used to improve nutrition—good food, tonics, and stimulants.

The General Conditions of the System, Fever, etc.—Their Remedies.

7. For excitement of the heart and arteries, and high fever, always important elements in the inflammatory process, and often excessive, requiring abatement, bleeding, though less useful and necessary than formerly supposed, is still applicable and very useful in some

cases when the excitement is high and the patient plethoric, and where hyperæmia oppresses important organs, interfering with their functions. It is folly to condemn this practice under such circumstances, and the dangers from loss of a reasonable quantity of blood have been by some greatly exaggerated. Besides bleeding, for fulfilling similar indications, we have cathartics, diaphoretics, and sedatives. As antipyretics we have opium, veratrum viride, aconite, gelseminum, jaborandi, antimony, salines, the *bath*, quinine, salicine, and salicylic acid.

8. For the general increase of fibrine we have the salines, alkalies, antimony, mercury, and diluents.

9. For the morbid increase of albumen, which occurs in some chronic, particularly in tuberculous cases, we have cod-liver oil, cream, and alkalies.

10. For general increase of the white corpuscles in the blood, quinine, and perhaps salicine and salicylic acid are the remedies.

The general anti-inflammatory and antipyretic, or antiphlogistic effects of quinine, is a subject lately attracting the attention of the profession, and is one of paramount importance. If the claims put forth for it are sustained--if the general experience of observing practitioners shall sustain the sentiments now held by some—an advancement is being made in practical medicine and surgery greater than any other which has occurred in recent times. In order that this article shall have its full and most striking effects in arresting inflammation it should be used early in the disease, and as much as twenty grains or more must be in the system at one time. It is appropriated and operates better after the bowels have been evacuated by a suitable cathartic, and its action is generally promoted by being combined with an opiate, the salts of morphia perhaps best, in decided but not heroic doses; and sometimes it may be combined with other agents, according to the type and location of the disease. That it is capable of arresting promptly many severe inflammations when early given, and abating markedly those more advanced, diminishing the suppurative process, and at the same time not depressing permanently the vital powers, when not continued too long, are opinions held so strongly, based upon observations so numerous, that something more than the neglect or refusal of the profession to faithfully try the practice will be required to convince the writer of their unsoundness. The particular methods of using this invaluable article, and something more of its mode of operation, will be described in connection with special inflammatory diseases.

11. For the increase of effete matters in the system and their retention—conditions occurring to a greater or less extent in inflamma-

tory diseases—eliminatives, as the patient may be able to bear them, are generally indicated. In the order of their general importance are cathartics—the saline generally best—very often preceded by a mild mercurial; diuretics, also the saline variety; diaphoretics, jaborandi, the most powerful; and cholagogues, not denying the power of mercury in this respect.

12. For the general depression from shock and sympathetic suffering, anæsthetics, stimulants, and narcotics will be required, and in the more protracted cases tonics—supporting food—such only as can be borne and *digested*, more than that increasing the irritation and depression. As stimulants and narcotics,—stimulants acting indirectly by relieving shock and suffering, if not directly upon the heart and brain,—we have alcohol, opium, camphor, ammonia, and various organic excitants; and in the more protracted cases, as tonics, the bitter vegetable principles, iron, etc.

13. For septic blood poisoning and its results there are the antiseptics and eliminatives, the sulphites, salicylic acid, quinine, etc.

14. For the removal of its effused products, after the inflammation may have subsided, there are sorbefacients, attenuants, eliminatives, stimulants, tonics, frictions, pressure, proper diet, and blisters. The preparations of iodine and mercury are often very important, judiciously used.

15. For the extreme heat sometimes occurring—hyperpyrexia—the cool or cold bath, cold affusions or packing (a very important agent), quinine, digitalis, salicylic acid, and some other agents included in what is called the antipyretic method are required.

16. For the debility following the active disease, nourishing diet carefully regulated, tonics and stimulants are applicable.

17. In all cases the stomach should receive care, as upon it chiefly depends the power to take and appropriate food, so necessary in protracted cases, and also the ability to take, appropriate, and endure the medicines needed. The means required for correcting its morbid states and preserving its better conditions may be various, according to the nature of each case. The liver and bowels, the kidneys and the functions of all the important organs should be looked to, and as far as possible preserved.

These are the principles and the agents applicable in the management of inflammation, and the physician who still practices his profession, and does not believe in their power to accomplish any of the results pointed out as desirable, must be a less useful member of the profession than one who has a reasonable confidence in them and skill in their application.

The circumstances calling for particular selections from these different agents, and the manner of their application, will be described in considering the different inflammatory affections.

In view of the acknowledged power of many of these agencies, and particularly in view of a long and varied experience, it is impossible to agree with the statement of a recent, and, on the whole, an able writer on the Practice of Medicine, that, "unfortunately, a direct cure, at all events a direct cure by means of drugs, in the great majority of cases, is totally impossible." * But here, as is so often the case, there is obscurity in the use of terms. If by a "direct cure by means of drugs," is meant the direct excitement of perfectly healthy actions by them, the statement cannot be controverted, and it applies to every case. But this is evidently not his meaning, as he mentions some cases, instancing ague, gout, and syphilis, where he says direct cures are effected by quinine, colchicum, and mercury, respectively. But by no means, he says, "can we cure the infectious fevers, *internal inflammations*, carcinoma, degenerative changes, or many of the functional and other disturbances to which the organism is liable." The italics are not his, but are added to call attention to the statement that internal inflammations are totally incapable of cure. If by this is meant that their processes cannot be arrested, or so modified that health results sooner, or as it would not without the use of remedies, the assertion I regard as intensely and injuriously erroneous. It is undoubtedly true that some internal inflammations are not arrested by any means that have been applied in the hands of the most skillful, and it might be inferred that none of them are ever arrested in the hands of the author quoted; but that they are in other hands, ought to be beyond dispute; and it seems an unjust disparagement of the profession, as it is the denial of a truth, to assert otherwise.

In some cases internal inflammations are not cured by any means; neither are some cases of syphilis cured by mercury, or gout by colchicum, or even malarial fever by quinine or arsenic. A larger portion of internal inflammations may defy treatment, especially when that treatment is commenced late in the course, than of gout or syphilis, by what he calls specific remedies; but this is exceedingly doubtful, if the inflammation is early attacked and vigorously and skillfully treated by the means we now have at our command.

Medicines, it is true, cannot do everything desired; but they can do many things desirable, when properly used; and this disparagement of them has been carried to an extreme. Nothing can be more judicious than the chief general indications, pointed out by this author, viz.: "1st. To promote the patient's general comfort. 2d. To support the patient's strength by appropriate nourishment. 3d. To maintain or restore the healthy tone of his nutritive functions. 4th. To promote the free action of his emunctories. 5th. To relieve the secondary phenomena or symptoms of his disease. And 6th. To obviate the tendency to death." But by what means are all these objects to be accomplished, if medicines are so powerless in cases of a severe inflammatory disease; and why not attempt to relieve the primary as well as the secondary phenomena of the disease?

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* Bristowe, Theory and Pract. of Med., 3d ed., p. 130.

The extreme views of the late Dr. Todd, of London, and Dr. Bennett, of Edinburgh, are passing away, as the personal influence of these distinguished men is fading. Their intense and indiscriminate opposition to what is called "depleting measures," was the result of a reaction from excessive depletion; and, particularly in the case of Dr. Todd, his advocacy of the large use of alcohol in acute diseases was due in part to wrong notions of the physiological and therapeutical actions of that article. These distinguished men have very few or no disciples who follow them in all their views at the present time, and it has become unnecessary to present and criticise them in full. It is better to have them forgotten; but some relics of them remain, as in the passages from the author quoted. Extremes always tend to follow each other, and the time may not be distant when it will be necessary to warn the profession against the extreme use of the lancet and other depletory measures. Though the lancet has its occasional uses now as ever, yet we have other and far better means for controlling fever and inflammation, and it is but rarely required. The changes that have occurred in its use have been attributed by some to a general change in the type of disease. That changes occur from time to time in the character of diseases, depending upon changes of habits and various other causes, as already pointed out, there can be no doubt; but that a great, wide-spread, and general change has occurred at the era of the change of practice from the strict depletory method, there is not sufficient evidence to prove. There have been more changes in opinions than in diseases, and in doctors than in their patients. Fluctuations in opinions on particular subjects are always occurring; but when the disturbed pendulum settles back to its proper equilibrium, advancement toward truth is usually found to have been made.

But inflammations, and the fever and other general derangements accompanying them, present different types at different times and in different places and in different individuals, requiring modifications of treatment.

The same general principles, however, with proper adaptations, apply to all cases of inflammations; and whatever special methods may be pursued with a view to controlling particular phenomena, there are some general indications for the management of cases which admit of formulation.

1. It is always proper to seek for the cause, and if present and found, to remove it if possible and safe.
2. Thus, and by every means, prevent further irritation of the inflamed part.
3. Procure rest, and particularly, as far as possible, of the part affected.
4. Observe the constitutional peculiarities and particular conditions of patients, and the kinds, types, degrees, and stages of the local disease, and adapt the remedies to the particular status.
5. Preserve, as far as possible, the function of the inflamed part, especially when that function is one important to life.
6. Consider whether it is safe and proper to use means with direct reference to arresting the inflammatory processes, and if so judged, use great care in their selection and application.

FEVER—PYREXIA—THE FEBRILE STATE.

The word Fever, in its original signification, indicates heat, or to seethe as with heat, while the word Pyrexia similarly indicates fire; and these terms, as applied to the body, indicate a condition of elevated temperature or preternatural heat.

The normal temperature of the human body, measured by the thermometer in one of its deeper cavities, though observers are not precisely agreed, averages about 98.8° F. for the twenty-four hours, but some slight fluctuations from 97.25° to 99.50° occur during that period.

According to the careful observations of Jürgensen, the minimum temperature occurs from 1.30 A.M. to 7.30 A.M.; the maximum, from 4 P.M. to 9 P.M., the temperature between 7.30 A.M. and 4 P.M. rising with some fluctuation; that between 9 P.M. and 1.30 A.M. gradually falling. The variation between the highest and lowest points is from 1° to 2°, rarely exceeding 1.5°. Material elevation above, or depression below, these points indicates a morbid state. The activity of respiration and circulation nearly corresponds with this rise and decline in the temperature. A slight elevation usually follows the taking of food, especially a full meal; and muscular exercise has also some effect, though more in bringing the circulation actively to the surface, and increasing the external more than the internal heat.

The active performance of functions in particular organs increases the temperature in those organs, but there is usually a corresponding diminution in other parts at the same time.

The ordinary changes of temperature of the medium in which the body is placed, the variations of summer and winter, have very little effect upon its heat, a remarkable uniformity being maintained. Though rapid changes, such as a cold bath, or exposure to a current of cold air, temporarily reduce the heat, and exposure to greater heat than that of the body temporarily elevates it, yet an elevation follows the depression and a depression the elevation, so that the twenty-four hours' mean is preserved. Even if from a morbid cause, but one which does not excite fever, the temperature of a part of the body is elevated, as by paralysis and distention of vessels and a freer blood flow, as sometimes occurs, there is a corresponding lowering in other parts. This preservation of temperature under varying influences seems one of the most essential conditions of the healthy organism, and must depend upon some very fundamental, but as yet not understood law.

Though the temperature of the body observes such strict laws in health, the uniformity is readily disturbed by morbid causes, and in a very large proportion of diseases, both acute and chronic, morbid variations—generally elevations—occur; and the pyrexial state is perhaps the most frequent of morbid conditions.

The word fever is used in one sense to indicate this pyrexial state, or preternatural elevation of temperature, from the operation of causes within the system, under whatever circumstances and for however short a time; but the word is used in another sense as indicating certain series of morbid phenomena, or particular diseases. In this sense a fever is not merely a state, but a process, produced by some affecting—often infecting—cause operating upon or within the system. In both these senses, but more particularly in the latter, we are to consider it.

The subject of the production of animal heat belongs to the physiologist, and until he has given a full and satisfactory account of the causes and conditions of the normal temperature, the pathologist cannot be expected to give a perfect account of the causes and conditions of its variations in disease. Some principles and facts in regard to this matter are sufficiently established; but, unfortunately, many points of detail, both physiological and pathological, are still in obscurity.

It must be admitted that the general laws of the production of heat in the animal body are the same as those which govern its production in other bodies. The forces in nature all act in connection with some form of matter, and the same force acts similarly in whatever form of matter it exists. Heat is a force in correlation with other forces, and can no more be created out of nothing than can matter. Matter changes its forms in the transmutations of nature, and so does force; and though before the advancement of science, and to grosser comprehensions, annihilations and creations seemed to occur both in matter and force, yet all such appearances were deceptive, and it is now well known that there are only changes of form in either. The vital power, itself a mode of force, is as incapable of effecting a new creation, either of matter or of force, as is light or heat, and it can only change the forms of the one or the other.

Heat is regarded as molecular motion, and its laws have been studied with considerable success. It is well known to be produced by arrested massive motion, and its exact equivalent of such motion is accurately ascertained. A body of a certain weight falling a certain distance by the force of gravitation, when arrested produces a certain amount of heat. The motion which is seen, when arrested, is converted into molecular motion, which may be felt and measured. Heat may be produced by chemical changes—by union of elements and the formation of new products—and electricity is also readily converted into it. It is also well known that heat diffuses itself, and that variously heated bodies seek an equilibrium of temperature. Heat passes from one body to another by conduction and radiation; and its manifestations are lost—it becomes latent—by various processes, of which evaporation is the one most important in relation to this subject.

Heat is produced in the body chiefly by chemical action, and the material which is acted upon is derived ultimately, as is all matter in the body, from the food. This chemical action consists mostly in the process of oxidation of substances containing carbon, hydrogen, and nitrogen, and the production of new compounds, as carbonic acid, water, and urea, etc.

Unquestionably, however, the friction of muscular action, and of the circulation of fluids; the check in the rapidity of the flow, as these fluids meet with greater resistance in passing into the minuter vessels; the more complete arrest of the motion of the fluids, as they unite with the solids; and the union and condensation of particles in the production of solid tissues (all of which processes are, perhaps, identical with the arrest of motion), contribute to the production of heat. Electrical phenomena are constantly occurring in the body, and, as electricity is readily interchangeable with heat, this may also contribute to its production. The comparative amount of heat furnished from these different sources it is impossible accurately to estimate; and while the chemical actions—the union of elements in the production of new compounds—may justly be regarded as furnishing the greater amount, the complete ignoring, as is often done, of all other sources, seems by no means justifiable.

The loss of heat occurs by radiation from the surface, and by conduction through substances in contact with the body—solid, liquid, or aeriform. The heat is largely reduced by the evaporation of perspiration, insensible or sensible; by warming the cool air taken into the lungs at each inspiration, and by evaporation of fluid from the pulmonary surface. Something is lost by the warming of cool ingesta, which take the place of warm excreted materials; and possibly loss may occur by electrical action, and also through the influence of the recently recognized "radiant matter," or, indeed, by other means of which we as yet have no conception. It is estimated that eighty per cent. of the heat of the body is lost by the skin, and twenty per cent. by the lungs. Of this loss by the lungs twenty-six per cent. is by warming the air taken into them, and seventy-four per cent. in evaporating the water which passes off from them.

In health the production and the loss of heat so nearly balance each other that the proper mean temperature is preserved.

In fever the production is greater than the loss; and when the loss is greater than the production, an opposite condition follows. If the loss is so much greater than the production that the temperature of the blood falls as low as 95° to 93°, there is great danger; and when coming below 92°, except in rare cases of poisoning by alcohol, where recovery has taken place after the temperature had reached 90°, death occurs.

Fever may result from increased heat-production, or from diminished heat-loss; and so an injurious or fatal reduction of temperature may be caused by a failure of the heat-producing function, or by the loss of heat from exposure to cold.

The increase of temperature in fever may vary from the slightest amount above the normal to 110° or 112° Fahr.; and cases have been reported where, under peculiar conditions of the nervous system, it has gone much higher even, without fatal effects. If the temperature does not exceed 101°, it would be said the fever was slight; from 101° to 103° it would be regarded as moderate; from 103° to 105°, decided or high; if above 105°, especially if reaching 106° and over, the term hyperpyrexia is now applied to the condition, and it is justly regarded as dangerous, and demanding decided interference; and if it exceeds 107° or 108°, and so remains for any considerable time, death, as a rule, results.

Febrile, like normal heat, usually undergoes diurnal changes. In some continued fevers, as typhoid, the fever line will be almost parallel with the line of health for the twenty-four hours, but from three to five degrees higher. In other cases the temperature fluctuates greatly, and often irregularly, depending on the increase or diminution of local morbid conditions; and in other cases still, very decided and more or less regular variations occur, as in remitting and intermitting fevers.

Although elevation of temperature, more or less constant, is a necessary condition of fever, and is sometimes regarded as the only essential one, yet in "a fever," considered as a process or distinct disease, the heat is only one of several conditions, and is not the first, nor perhaps the last one present.

In such fever there is an onset, an accession or increase, a period of continuance, and a declension and disappearance; and each stage has its peculiar features.

At the onset, usually, after a feeling of general indisposition, there is a rigor or shivering, a subjective feeling of coldness, and generally some real reduction of temperature of the surface of the extremities, while there is already elevation of the temperature of the blood, as shown by the thermometer in the cavities, or even applied to the trunk; and not unfrequently sensations of chilling are felt while the temperature even of the extremities is increased. At the time of the chill there is usually paleness or blueness of the extremities and the face, and a shrunken condition, showing that there is but little circulation in the extreme vessels of these parts. As the quantity of blood in the system is not materially changed, more must be in the larger vessels or in the interior organs; and less blood coming to the surface, and the surface being colder, there is less loss of heat by radiation and conduction from the extreme heat-losing plane; the secretion of the skin is diminished by the smaller blood-flow to it, and evaporation is less from the lowered temperature; the heat loss is also less from perspiration and evaporation.

The respiration is usually hurried in frequency during this stage of rigor, but from the comparative congestion of the lungs it is often superficial, and as it is not likely that the blood passes as freely through the lungs, from the probably contracted or spasmodic state of the capillaries, not as much moisture is evaporated from the pulmonary surface; so that if these suppositions are correct, not as much heat is lost in this stage by the lungs. But however this may be, the loss is certainly less from the cutaneous surface than when the hot stage is fully developed; and as the production of heat in the internal parts of the body goes on, doubtless with increased rapidity, the accumulation of heat is rapid and soon manifests itself over the entire surface. In the intermediate stage between the cold and the hot, there are often alternating sensations of heat and cold.

The hot stage now becomes fully developed; the sensations of chilliness are replaced entirely by those of heat; the pulse, which before, though rapid, was contracted and smaller, now becomes full and strong, as well as fast; the vessels of the surface are distended with blood, the face is flushed, and the full condition of the febrile state is manifested. This state of increased temperature continues, with more or less diurnal and other fluctuations, for various periods, in different forms of fever, until the stage of decline. This may be sudden, by *crisis*, or more gradual, by *lysis*, and this decline is often accompanied by freer discharges from the skin, the kidneys, and the bowels. The stage of recuperation and repair follows, and the normal condition is restored.

During this occurrence of deranged and increased temperature, other phenomena have occurred, quite as important as those mentioned. Even before any noticeable change of temperature, general morbid sensations have probably been experienced; pains may have occurred in the head and other parts of the body, and there has been more or less change in different functions; a proper examination would detect an increase in the urea and uric acid secreted. Whether these conditions precede the increased temperature or not, they accompany it, and a general derangement of the whole organism exists. There is pain in the head, often accompanied or supplanted by delirium, a coated tongue, increase and change of its epithelium, thirst, loss of appetite, often restlessness, and always muscular weakness. Sometimes convulsions and coma occur, with profound derangements of different functions, and not unfrequently death. In short, in the process of a fever, changes take place in the calorification, in nervous action, in the blood, in the circulation, in respiration, digestion, secretion, and in general nutrition.

The repair which follows in favorable cases is not a part of the fever process, and may be omitted in a discussion of the pathology of the diseased condition.

Dr. Senator, of Berlin, found by experiments upon dogs, that injection of pus in their blood was sure to induce the phenomena of fever; but, as the first effect, before the rise of temperature, an increase of urea took place. As urea, when but little or no food is taken, as was the case with these animals, is derived from destruction of nitrogenous tissues, the inference, from its early increase, is that the destructive metamorphosis of these tissues is the primary morbid condition in fever. During this initial stage the quantity of carbonic acid and aqueous vapor produced was not increased, but often diminished. In the later stages, when the heat appeared, the excreted carbonic acid and water were much increased—this "insensible loss," together with the increased loss by urea, continuing during the whole course of the disease. From the very first impression of the morbid cause, the quantity of urine passed was augmented.

Although this was the general fact, there were great fluctuations in the rapidity of these losses, and also in the functions of different organs. Indeed, according to these observations, the carbonic acid emitted was not always and necessarily in excess during the elevated temperature.

These increased chemical actions, indicated by the increased production of their results, must necessarily cause an increase of heat; and the increased heat causes more rapid disintegrating changes. Heat increases destructive action, and destructive action increases heat. In proof of the increased destructive metamorphosis by increase of heat, it was found that the amount of carbonic acid was increased by the communication of heat from without. While the kidneys remained in a comparatively healthy condition, as was the case with these dogs, the quantity of urine was increased, doubtless produced by the diuretic action of the urea, which was in increased quantity in the blood. The rapidity of the circulation might tend to the same result.

During the rigor, less water passed off from the skin ; but during the hot stage, and particularly toward its close, more water was lost by insensible perspiration, the more rapid evaporation from the higher temperature of the skin preventing the secretion from the sweat glands from becoming sensible. As the heat declined, and sometimes before such declension, "all the water channels were wide open." Increased temperature caused both increased evaporation and increased discharge of carbonic acid, as already stated ; but in the case of the dogs there was said to be no proofs that these increased discharges were produced by the cause of the fever. When the fever was intermitting, the loss of the system was more than twice as much on the fever days as on the well ones, food being taken on neither. The greater loss of weight on the fever days was said to be due chiefly to the greater loss of water on those days.

In careful observations made on human fever patients, similar results were found to occur. The loss of weight of the fever patient was from one half to three times that of a well man placed in the same circumstances in bed, and taking the same amount, or rather restricted to the same amount, of food and drink. The condition of nutrition antecedent to the attack of fever varied the amount of loss.

If well fed and well nourished before, the loss was greater. The loss of nitrogen by the kidneys can be measured in the urine; but the loss of this material from the bowels, the skin, and by means of exudates, cannot be ascertained.

In these observations different forms of disease were under investigation, having nothing in common but the febrile state.

The conclusions of Prof. Burdon-Sanderson (from whose report to the Privy Council of England, published in *The Practitioner* of 1876, these observations by Prof. Senator have been gleaned) are that in the early stage of fever the patient secretes three times as much urea as the same man on the same diet would do in health; but that later in the fever there is not so much difference.

A healthy man's urea is mostly from his food; in fever it is from the tissues. This loss of tissues, as indicated in the increase of urea, Dr. Sanderson regards as the most essential condition in fever. It commences earlier and continues later than the heat, its maximum being after the fall of temperature. He concludes, therefore, that it is not the increase of temperature, not the pyrexia, which causes the increase of urea. With regard to the greater increase of the discharge of urea after the fall of the temperature, he seems not to have taken into the account the important fact that the urea *accumulates* in the system during the fever, and may be eliminated by the kidneys after its abatement and the revival of their function, though urea may have ceased to be produced in any extra quantities from the tissues. Taking this into consideration, his last conclusion, if based upon the continuance of the free discharge of urea after the fever heat abates, seems not to be sustained.

Inquiring into the particular sources of the nitrogenous loss in fever, it is to be noticed that the nitrogen elements exist in the system, *First,* In what is called store albumen in the fluid or plasma of the blood and lymph, and in the juices of the tissues; and, *Second,* In the substance of the tissues, in their protoplasm, including the protoplasm of the blood corpuscles.

In health there are more soda salts than potash salts in the urine —fifty-nine of the former to forty-one of the latter. In the fever state this is reversed. There is a positive increase and a very large relative increase of the potash salts, with a positive and relative diminution of the soda salts. The increase of the potash is three or four times above the normal, while, at the time of convalescence, the soda increases and the potash greatly diminishes. The urea thus is evidently produced from substances containing potash. The store albumen, that is, the liquor sanguinis, abounds in soda, but the blood corpuscles and muscles contain potash. The inference is that urea is derived chiefly from the tissues—largely from the muscles and the blood corpuscles; and this inference is strengthened by the facts that the muscles rapidly waste, and the coloring matter of the blood corpuscles appears freely in the urine, indicating their disintegration. The anæmia which the fever produces confirms the conclusion.

Common salt seems to be retained in the system during the state of fever, as it is freely discharged after its abatement. The destruction of the colored corpuscles, interfering with their function as oxygen carriers, deranges the whole system. Probably that function is impaired in corpuscles not entirely destroyed. But this is another unknown quantity in the problem of fever which pathologists are endeavoring to solve. Prof. Leyden has more fully investigated the amount of carbonic acid expired in fever and in health, and comes to the conclusion that in the febrile state about fifty per cent. more is given off from the lungs than in health, where all other conditions are the same.

From the report of his observations, Dr. Sanderson concludes that both men and animals discharge more nitrogen when laboring under fever than in health, with the same amount of "nitrogen income;" in man about three-fourths more than normal. The excess of carbonic acid lost in a fevered man is not to be accounted for by mere excess of respiration, but the experiments do not show that the same excessive loss by carbonic acid occurs in the case of fevered dogs.

Although a patient suffering from fever loses much by the discharge of nitrogenous, carbonaceous, and aqueous material, and therefore has more heat produced from these sources than one taking the same amount of food who is in health, still the same individual on an ordinary full mixed diet discharges about the same quantity of all these materials; and on the supposition that heat in the body is entirely produced from these particular chemical sources, and that these excreta accurately measure the heat produced, it follows that a well man has as much heat generated in his system as the fever patient. As his temperature is not as high, it is assumed that he loses more heat than the patient with fever. It is true that in the fever patient the excreta are produced chiefly from the consumption of tissues, while with the well man they are chiefly produced from the food he takes; but the source of the materials would have no influence on the amount of heat produced by their consumption. But experiments show, as we should infer, that the heated body of a fever patient radiates more heat, his lungs warm more air and exhale more vapor, and therefore part with more heat in doing so; and the skin, though apparently dry, really in most cases evaporates more water from its surface, and therefore the body loses more heat from this source. It is contrary to all analogy and all reason that the same body five or six degrees higher in temperature in its external plane, will pass from its surface less heat, will communicate less warmth to surrounding objects, than when its temperature is lower. It would be quite absurd to suppose that a radiating steam-pipe heated to 212° would throw off less heat, or lose less from evaporating a given amount of water, than one at a temperature of 207°. Indeed, Dr. Leyden concludes, as the result of his long continued and carefully conducted experiments, that "the discharge of heat is increased in fever, whether the temperature is constant or whether it falls or rises, consequently it is certain the product of heat is increased." The only exception to the fact of the loss being greater, is during the cold stage, when the temperature of the surface is low. If the fever patient does not lose less heat, but more, it is certain, as Leyden says, that he produces more to keep up the fever temperature; and if no more combustion occurs in his system than in that of a well man, a portion of the heat must be produced in some other way than by this chemical combustion.

This establishes the fact that heat is produced in other ways than by the mere combustion of carbon, nitrogen, and hydrogen; and that the quantity of excreta from these substances—the amount of urea and carbonic acid discharged—is not the exact measure of the heat produced in the system.

All theories based on the assumption that this particular form of chemical action is the only source of animal heat, normal or morbid, must be worse than useless, leading to absurdity or false conclusions. Says Hermann, Physiology, 2d ed., p. 246, "We cannot forget that oxidation is not the only process associated with the liberation of energy, but that it is only one of the processes, though by far the most frequent, which prove the general law, that in every chemical process, in which stronger affinities are saturated than were saturated before its occurrence, potential energy becomes kinetic." It is well known that other forms of energy are transformed into heat by processes other than chemical, and that other kinds of chemical action than oxidation, as stated, transform latent energy into apparent. The transforming of latent into sensible heat is the most common of all these transformations. As an example, the conversion of sugar into alcohol in the process of fermentation is not an oxidizing process, but yet heat is developed. The conversion of motion into heat by friction, already referred to, is familiar. Hermann further says, that in the body in a state of rest all forms of energy are converted into heat; and instances particularly the loss in motion of the blood by friction against the walls of the blood-vessels, and especially the capillaries, as an evidence of such conversion. He also says the electricity developed in the nervous and muscular systems appears in part to be converted into heat, and almost every change in the body is accompanied with change of temperature. In view of such facts, it seems very strange that so many of both systematic and speculative writers speak of body heat as alone the product of the combustion of certain elements.

Dr. Lionel Beale, in treating of inflammatory fever, expresses the opinion, in the article already referred to, that the fever heat does not depend upon increased oxidation at all; but he does not indicate upon what it does depend. On this point he simply says, "Fever is caused partly by diminished heat loss, and partly by increased heat production." He lays great stress upon changes of the blood as the starting-point of fever and the cause of its continuance; he makes much of its containing "extractive matter soluble in boiling water," in free and abnormal quantities, and says it is produced "probably from deficient oxidation," stating that various substances remain in the system unoxidized, and pass out slowly and but partially oxidized.

This morbid matter while in the blood, he says, penetrates the tissues too freely, and there is an increased growth of germinal matter, which is readily appropriated by the morbid tissues. He does not state particularly whether, or how, this produces heat; though he might have plausibly suggested that it was by its condensation or its chemical union with other materials of the body. He does not account for the excess of urea and uric acid in the urine. Dr. Sanderson does not allude to there being any excess of uric acid, and Dr. Beale leaves other important matters unexplained.

It seems at least possible that the destructive metamorphosis and oxidation, complete or partial, of the tissues, prevents oxidation and removal of the other albuminous and carbonaceous matters which should have speedy exit from the system. It may be true, if it is not demonstrable, that in fever the protoplasm of the tissues, modified by the presence of zymotic matters, or from other causes, has an increased affinity for oxygen and readily undergoes destructive oxidation, while the "extractive" and other matters fail to be properly oxidized and eliminated; the oxidation of the tissues contributing, with other causes, to the production of the abnormal heat.

But, as very justly said by Dr. Sanderson, a full and satisfactory explanation of fever is not yet possible; we are not yet possessed of sufficient physiological data. Many speculative opinions have been presented, and some of them may prove useful in aiding investigation. One view is that fever originates in disorder of the nervous centres—

that, by means of the influence of the nervous system on the systemic functions, the liberation of heat at the surface of the body is restrained, so that by *retention* the temperature rises; and finally, that the increased temperature so produced acts on the living substance of the body so as to disorder its nutrition. We have seen that though, during the chill, which frequently but by no means always ushers in an attack of fever, the escape of heat may be temporarily diminished, yet that *retention* cannot be permanent, and in all probability, in many cases, never occurs at all. It is, at all events, totally incapable of affording an explanation of the phenomena.

Another view is that fever originates in the living tissues—that it is, from first to last, a disorder of the vital protoplasm, and that all systemic disorders are secondary.

In most theories it is now assumed that a fever-producing material is in some way introduced or developed in the blood, the lymph, or tissue juice; its disturbing influence, whether upon brain and nerves, or upon the elements of the tissues, being anterior to all.

That such is the fact in many fevers, probably in all that are of a specific character, can scarcely be doubted. Feverish excitement, however, is often produced by the most strictly local impressions where there is no probability, and scarcely a possibility, of there being anything primarily wrong with the blood. Even mental impressions may excite a febrile movement, and here the primary morbid impression must be on the nervous system.

Virchow, whose opinions will have weight with many, says: "Fever consists essentially of elevation of temperature, which must arise from an increased consumption of tissue, and appears to have its immediate cause in alterations of the nervous system."

That all the heat of fever is produced by the consumption of tissues, we have seen reasons for denying; but that the nervous system has much to do in originating and controlling the processes which result in feverish heat, seems certain.

This brings us to consider the *causes* of fever, or those impressions, conditions, or materials capable of so affecting the nerves, the blood, or the protoplasm of the tissues as to result in the complex phenomena of this process.

Physiological researches have established the fact that there exists in the nerve-centres, cerebral and ganglionic, groups of cells which are exciting or accelerating, and others which are inhibitory or restraining, whose office it is, in part, to govern those forces in the heart and vessels which circulate the blood. These exciting and inhibitory cells are widely distributed. They are found in the brain, in the heart itself, and in ganglia along the course of the vessels. This control, originating, as all nervous power does, in the cells, is exerted through nerves which go to the heart and accompany the vessels to their minutest ramifications. Some of these excite the heart and vessels to contraction, some restrain their movements, and there are those which by their action have the effect to cause dilatation of the vessels. (Hermann.)

The nerves accompanying the vessels and exciting them to contraction are called vaso-motor, or vaso-constrictor nerves—those opposed to them in action are called vaso-dilator nerves. The vaso-motor seem always in action, keeping up the tone of the active vessels, while the vaso-dilators are thought to be only occasionally active, and to produce their effect, when excited, by preventing the activity originating in the vaso-constrictors.

In particular regions local nerve-centres are connected with certain vascular areas—the whole mechanism, however, being under a general controlling influence of the centre cells, chiefly located in the medulla oblongata. There are also secretory nerves, terminating in glands and uniting with the vaso-motor nerves in influencing their functions; and, more to the present purpose, there are trophic nerve-fibres which terminate in particular areas of the molecules, cells, and tissues of the body, parenchymatous and connective, regulating the more intimate actions—the chemical and physical changes resulting in the various processes of nutrition.

That in the nerve-centres and nerves there is an influence or "energy," controlling, probably in part directly, and in part through cardiac and vascular activity—undoubtedly to some extent through trophic changes—the production and the loss of heat, and consequently regulating the temperature, there can be no question ; and if the regulation of the temperature, so remarkable, and so curiously adjusted in health, depends upon the nervous system, the inference is a fair one that in a similar degree its derangements will depend upon faulty conditions of this system, and morbid impressions upon it. We find from observation, which is better than theoretical inferences, that the shock even of a physical impression, or of almost any injury, whether inflicted upon tissues by mechanical or chemical means; that almost any morbid material in the blood or lymph, or changed conditions of these fluids, make impressions, some of which could only be upon sensitive nerve elements, and could only be communicated through the wide-spread influence of the nervous system, so as to excite feverish changes. Some of these causes seem to act more directly in inducing the fever ; others, more indirectly, through other tissues, or by derangements of particular functions. Thus we find surgical injuries or operations—sometimes so slight an operation as the introduction of a catheter; the presence upon wounded surfaces of irritating substances; the suppression of secretions from the skin, liver, or other glands; the retention of effete matters in the blood; the presence of irritating matters in the alimentary canal, or the irritation of a coming tooth, will produce the pyrexial state. Every form and degree of inflammation, sometimes even the mental shock of a great calamity, and particularly the absorption of morbid material from inflamed parts, will induce this condition.

As already intimated, the specific fevers, which comprise a large and vastly the most important and formidable part of fevers with which the physician has to deal, depend upon specific poisons. These are probably protoplasmic, living substances, capable of multiplication, introduced from without or developed in the body, which effect chemical and vital changes in the fluids and solids, impressing, either directly or by these changes, the nervous system, and deranging its actions; these impressions are followed by the febrile phenomena already sketched, and by a variety of modifications to be described in the special kinds of fever which will require our careful attention.

It may be too much to affirm that this infectious or zymotic origin of all the specific fevers is demonstrated, especially that their dependence on living organisms has been fully proven; but the facts that have been established respecting the existence of microscopic germs, their wide diffusion, their persistent vitality, their eagerness for elements and their ready appropriation of them, their ability to disturb the chemical relations and composition of organic bodies; their influence, so unquestionably shown, in producing fermentation, putrefaction, and other changes in various forms of matter; their evident capability of exciting inflammatory, suppurative, and septic processes in wounded animals and men; the success that has followed the greater care as to cleanliness and the use of various antiseptic measures; the certainties with which all are familiar respecting the propagation of small-pox and the vaccine disease; in short, the vast accumulation of evidence pointing in the same direction, has brought the great mass of the most enlightened members of the profession to an unreserved belief in the theory of the zymotic, if not the bacterian causation of all the specific fevers.

The present knowledge on this overwhelmingly important subject is by no means so complete as to preclude the hope of future discoveries even more important than those that have yet been made. In this direction lies the greatest hope of the future of medical science and art. When Science has discovered the origin, the full character, and the mode of action of these agencies, and the materials and influences which will destroy or counteract them without injury to the organism, and when Art has devised effectual means of applying these, then will medical science and art have met together in a harmony of equality, and have accomplished for humanity its greatest achievement.

Considering the very large and increasing number of diseases believed, with so much reason, to be produced by morbid poisons, and the great influence the nervous system has upon the phenomena resulting, in the advanced state of knowledge hoped for, antidotes and neurotics—the one radically curative, and the other modifying and relieving—will become the great medicines of the future.

In view of the present state and drift of science, the phenomenal character of diseases, the existence of specific causes, and the present and hoped-for discoveries of antidotal remedies, how absurd and ridiculous become the dreams of exclusive systems, particularly of the pretended universal therapeutical principle of ***similia similibus curantur.*** Such unfounded speculations, originating in the darkness of the past, and kept up by visionary or unscrupulous men of the present, unknown to science, must recede more and more into the obscurity of past follies as science advances.

On the Theory of Infectious Diseases, in a paper read at the meeting of the International Congress of Medical Science for 1879, held in Amsterdam, and which seemed to reflect the views of those present, comprising many of the most prominent men in the profession in the different countries of Europe, it seemed to be assumed by the author, as well as by the president of the congress in the opening address, that the infectious diseases generally are produced by microzymes or living parasitic organisms; and the following conclusions were arrived at, which may be regarded as one of the most authoritative expressions of the present enlightened professional sentiment on the subject:

1. It may be regarded as certain that the action of the micrococcus of fermentation, which plays such a prominent part in the production of certain infective diseases, of which charbon may be taken as a type, is the same in all the diseases of the same order.

2. We are, therefore, justified in looking upon infective diseases as being closely allied to the parasitic diseases.

3. The parasitic micrococci, which cause infectious diseases, behave in the organism like ferments. They cause much disturbance,

both by the formation of new bodies that poison the organism, and by robbing the latter of necessary materials.

4. To every specific infectious disease, there corresponds necessarily a specific cause.

5. There is reason to believe that all the microcosms of infection belong to one and the same family, viz., to septic ferments. Surgical septicæmia, different varieties of typhoidal fevers, etc., are septic or septicoid affections.

6. As the micrococci of infection are septic ferments, they are capable of living and multiplying when out of the human body.

7. In certain infectious diseases, *e. g.* malaria, the infected individual invariably receives the germs of infection from his surroundings, never from other individuals who have already been infected.

8. In other infectious diseases, *e. g.* enteric fever, the patients are themselves foci of germs which, after having been transmitted to the outer world, infect the food (ingesta), the infected individuals becoming thus, indirectly, foci of contagion.

9. Other infectious diseases, *e. g.* exanthematic typhus fever, where the germs not only infect the ingesta but the surroundings—the air—the infected persons thus becoming active foci of direct contagion.

10. In diseases such as the vaccine disease, the virus is attached to solid matter; but we do not know whether these particles are micrococci, similar to the organisms of the other diseases, or not. It has not been possible, as yet, to breed this virus outside of the living organism; nor does the effect which certain poisons have upon them, at all correspond to the qualities attributed to living beings. Perhaps further experiments and observations will tend to prove that all contagious diseases are of the same nature, in which case they would all become parasitic diseases. In the International Medical Congress of 1881, held in London, similar general views were quite as positively expressed, and the recent experiments of Pasteur in regard to the disease of the domestic fowls called the "Chicken Cholera," and in regard to charbon or splenic fever in cattle and sheep, have still further confirmed the views expressed two years before at Amsterdam. That these particular diseases are produced by parasitic germs the experiments of this distinguished discoverer and experimenter seem to have placed beyond doubt.

These are not quoted as the exact truth, but as opinions of one who has given much attention to the subject, and as representing prevalent views. In the case of the vaccine disease there must be living germinal matter; but there is no evidence that there are distinct organisms or parasites; and it may turn out that some of the other poisons, supposed to be parasitic, are, like the vaccine virus, germinal matter, but not distinct beings—not micrococci. As to particulars on this whole subject, much is still conjectural; and as to antidotes, but little is yet known. Quinine and various other substances seem to act as antidotes to malaria; but whether they destroy the germs, or only prevent the system from responding to their poisonous effects, in the phenomena of fever, is not positively known.

But in what way do germs, or any other poisons, or morbid impressions, act in producing the phenomena of fever?

However desirable an answer to this broad question may be, it cannot at present be fully given.

Some have supposed that the microzymes consumed by their growth and multiplication sufficient quantities of the tissues, or the materials destined for their nutrition, to cause the heat, thirst, etc., and that the pains, the delirium, and other perversions of function, are produced by deficient nutrition, the result of the consumption of nutrient materials by these organisms. Others, as already stated, suppose the mischief results both from loss of needed ingredients, and the production of poisonous substances, which irritate tissues and nerves, these poisonous substances being the result of zymotic actions, of chemical and physical changes, induced by the infectious agents. It is possible these organisms are capable, of themselves, by their presence in connection with nerves and tissues, of producing irritation and these various results.

As to other morbid impressions, we know they are followed by feverish excitement and derangements, as we know other ultimate facts. It has been suggested that the shock of an injurious impression produces an effort on the part of the system to resist the intruding injury, and a feverish excitement is the result. That there is a law in the system which leads to the resistance of injuries and to efforts at repair, we have frequent proofs. How much this law is concerned in the production of fever, it is difficult to say. Response to irritations—reaction to shock—is a fundamental law, and is the best explanation we can give for the various phenomena observed. But whatever may be the object or tendency of a fever as to the removal of an injurious cause, the effort itself may be of a character to produce danger, and to require interference and control. We cannot say why sugar gives the sensation of sweetness, or quinine of bitterness. We cannot explain the ultimate causes of the normal regulation of temperature, and hence we ought not to be expected to say how a particular agent or impression deranges that temperature, and we must be content with knowing that certain agents do produce fever, and that certain other means will prevent or mitigate the process. In the absence of a satisfactory knowledge of the latter means, we must have the courage of patience and the energy of carefulness in the empirical use of such measures as science has suggested and experience has proved to do good.

In health the body is able to preserve its temperature nearly the same, however rapidly the cold bath or an exposure may abstract heat, or however quickly a high external temperature may add to it. In fever, however, this is not the case, at least to the same extent. In typhoid and other fevers the temperature can be brought down and kept down nearly to the normal by the systematic use of the cold bath or cold affusion; and various antipyretic medicines, notably quinine and salicylic acid, are capable of reducing feverish heat, though they may have little or no effect in reducing temperature in the normal state. In fever the law of sustained temperature is not abolished, but only weakened, as there is a tendency, and in some cases a very strong one, to maintain the high grade belonging to the disease. In health there may be, as suggested by Dr. Sanderson, a tendency to excess of heat, which is restrained by that protecting influence called "the law of temperature." So in fever the influence may still exist and need to be strengthened, as it is by the administration of large doses of quinine, or the extraction of heat from the surface by the cold bath.

But this is a speculative suggestion, not having the weight of an induction; and in view of the notion that the increased heat is the result of an effort to resist and remove an injury, the utility or propriety of thus abating the heat is a question to be determined by experience, and will be considered when we come to the treatment of particular forms of fever. The special causation and phenomena of the different forms of fever, and various other questions, will then be more particularly discussed.

The general subject of fever which has occupied our attention, the statements of conditions belonging in common to all varieties, will both save time in the descriptions and give us a better understanding of the different forms of the disease we have to study.

The febrile state appears under a variety of particular forms, produced by different causes, and presenting different aggregates of phenomena, that admit of classification and naming.

The following table gives a classified view of the different fevers we have to deal with :

CLASSIFICATION OF FEVERS.

- 1. SYMPTOMATIC.
  - Irritative.
  - Inflammatory.
  - Hectic.
  - Pyæmic, and Septicæmic.
  - Catarrhal.
- 2. IDIOPATHIC.
  - —NON-SPECIFIC.
    - Simple,
    - Accidental,
    - Febricula.
  - —SPECIFIC.
    - *Periodical* or *Malarial.*
      - *Intermittent.*
        - Quotidian.
        - Tertian.
        - Quartan.
      - *Remittent.*
        - Gastric.
        - Intestinal.
        - Bilious.
      - *Pernicious.*
        - Congestive.
        - Collapsing.
    - *Continued.*
      - Typhoid, Typhus,
      - Relapsing, Yellow,
      - Whooping-Cough,
      - Mumps,
      - Cholera, Plague,
      - Dysentery, Diphtheria,
      - Influenza,
      - Dengue, Cerebro-Spinal.
      - Miliary Fever.
    - *Eruptive.*
      - Small Pox, Cow Pox,
      - Chicken Pox.
      - Measles,
      - German Measles,
      - Scarlatina,
      - Epidemic Roseola.

All fevers, as we have seen, appear to depend proximately upon some changed state or action of the protoplasmic tissues, under the influence of a changed condition of particular nerve-centres and nerves ; and these conditions may be produced by many causes, physical, chemical, toxic, or mental—the more severe and regular, or, as they are called in the classifications, specific fevers, being caused by changes in the blood and tissues, for the most part, at least, induced by zymotic poisons—by germinal protoplasmic matter, in most instances probably in the form of distinct parasitic organisms or microzymes. Each fever has its own peculiarities in causes, phenomena, and course ; but the previous states of the system have an influence upon the severity and type of all the forms.

They are more severe in the depressed, the exhausted, the obese, and plethoric, and especially in the alcoholic intemperate. There are also special prevailing types in particular seasons and places, materially modifying the prognosis and treatment; and the changing of types, the mingling of forms, and their conversion or substitution may occur.

A fever commencing in a mild form may, as it progresses, take on one more severe, thus suffering a change of type. Two fever causes, each with more or less of their peculiar phenomena, may be operating upon the system at the same time, thus producing a mingling of forms, as in typho-malarial fever; and an attack commencing in one form may lose its character and another take its place, a conversion or substitution of kinds thus being produced.

The terms used in the classification explain their applications, but a more explicit statement of the technical signification of some of them may lead to a more precise comprehension of the distinctions.

By a symptomatic fever is meant one which is a symptom or a result of some other distinguishable pathological condition. Thus the fever which follows and is dependent upon an inflammation, is symptomatic of that pathological state.

An idiopathic fever, on the other hand, is one which is itself the disease, depending of course upon a cause, but a cause that produces only or chiefly the phenomena which are considered as belonging to the fever.

A specific fever is one produced by a peculiar poison, or an exclusive or specific cause, and the fever runs, or strongly tends to run, a definite course.

A non-specific fever is one which does not depend upon a specific poison, and has not the same tendency to run a particular course. Such a fever is caused by more common disturbing influences, such as exposure to cold, checking secretions, dietetic excesses, various physical and dynamical impressions not of a specific character, and not necessarily producing other special effects than the phenomena of fever. The signification of other terms will be given as we come to describe the diseases they indicate.

There are various Minor Diseases, most of which are accompanied with feverishness, which may be considered here before entering upon the description of more definite diseases, having a place in nosology, having distinct, well-marked characters, and to which are applied more specific names.

MINOR DISEASES, OR SLIGHT AILMENTS.

There are various slight deviations from the normal standard of health but little treated of in works on the practice of medicine, but which, from their great frequency, from their being often neglected, and from their liability to terminate in more serious diseases, require some separate consideration.

There are very few persons in our communities who do not suffer at times from slight derangement of the actions of the system, producing more or less uncomfortable sensations, inefficiency, or more positive suffering and incapacity; and yet they have no well-defined diseases, no perceptible changes in the tissues of organs, or conditions likely to directly result in such changes. In many such instances the derangement probably depends upon the rate at which normal functions are performed, or upon a want of that balance of activities which constitutes the most perfect health.

These semi-morbid conditions are sometimes produced by a wrong state of the blood and lymph, by some moderate excess of the effete materials which are so constantly passing through the fluids on their way to elimination by the excreting glands, or by some improper matter introduced into it in the ingesta, or produced in the system by imperfect digestion and elaboration, or by imperfect secretions. In other instances the solids are at fault—some changes of innervation from fatigue and exhaustion, or from deficient or improperly proportioned activity, or from impressions from without; and even mental states may derange the various physical activities.

Through modified innervation the blood may flow too slowly or too quickly through the vessels; the capillaries may be too much distended or too empty in particular parts, disturbing the action of the adjacent nerve-fibres, and thus causing uncomfortable sensations.

Errors in food or drink, as to quality, quantity, and time of taking; an atmosphere too cold or too hot, too moist or too dry; a want of sleep, and a great variety of other imperfect hygienic conditions may be causes of derangement of action, which the system in time will overcome, but which, meanwhile, produce the phenomena of slight ailments. Many persons pay little heed to these derangements, as they are found to be temporary in their continuance; but others have not the same recuperative powers; their sufferings are more protracted and severe from these slight causes, and they seek the aid of the physician, who should be prepared to advise them both as to prevention and cure.

The student who has received his practical knowledge of disease entirely from observations in large hospitals, and in the dead-houses so liberally supplied from them, where he has studied structural changes produced by severe disease, will often, when coming into practice, be at a loss to know what to say or do when he is consulted by a patient who presents no evidence of any structural change, who has no train of symptoms characteristic of any of the diseases arranged in the classified nosologies, and who complains of morbid sensations and functions, the causes of which the stethoscope, and even the microscope and chemical reagents fail to detect. Possessed with the anatomical and chemical ideas of pathology, he may conclude that nothing is the matter where he can see nothing, and may destroy the confidence of patients by expressing hasty opinions of the absence of disease where it nevertheless exists. A patient with a slight ailment that will of itself soon pass away, when he calls upon a physician is entitled to all the aid his art can afford; and though active medication may not be required, careful attention to the case is demanded, and advice may be of great service in relieving apprehension and mitigating suffering. There are very few cases where benefit to some extent cannot be derived from treatment. In the management of such cases tact is required, but it should not be allowed to degenerate into disingenuousness.

Great principles of pathology and therapeutics may be learned from slight as well as from severe diseases. As in zoölogy, studying the simplest forms is the surest method of obtaining a knowledge of the most complex; so studying the slightest deviations from the healthy processes will lead to a knowledge of the more grave changes; and we may often best learn from the effects of remedies on slighter ailments their tendencies in the graver diseases.

The means that will shorten a slight fever, congestion, or inflammation, will tend to *relieve* one of a severer character; and the remedy that will arrest a slight fever or inflammation, when pushed with more vigor, will often do the same thing with a much severer attack, especially if applied in its earlier stages.

Many of the slight ailments to which patients are subject are not definable. They are spoken of as "indispositions." The patient is said to be "out of sorts," to be affected with "biliousness," or to have "derangement of the stomach," "headaches," "feverishness," "pains in the bones," "rheumatics," "neuralgia," "colds," etc. Most common among the symptoms are loss of appetite, feelings of dullness, general or wandering pains, dizziness, unpleasant taste in the mouth, furred tongue, foul breath, headache, debility, etc. These symptoms will be recognized as belonging to much more grave affections—to more definite diseases; but they exist where the more definite diseases are absent.

While some of these cases are of short duration, others are more protracted; and some people seldom feel well, though it would be difficult to say they had any definite form of disease.

Many milder affections are properly attributed to functional diseases of the stomach, the bowels, or the liver; some to disease of the kidneys; and, with females, many to derangements of the pelvic organs. Those general derangements, traceable to any one of these sources, are treated of in other connections. Indeed, most of the cases of slight ailments are better discussed in connection with the diseases of particular organs in which their phenomena are most exhibited. The main object in giving them a separate discussion is to call more particular attention to them, and to afford an opportunity for offering some general suggestions, which otherwise might not find a convenient place.

THE TONGUE IN HEALTH AND IN SLIGHT AILMENTS.

The tongue, in severe disease, is always examined, and its appearance and indications are described in connection with particular affections. Its appearance in health and in slight ailments is of interest. This appearance differs in different persons in health, and in the same conditions of disease. Generally the epithelium, on the dorsum of the tongue, forms a layer of considerable thickness, covering the minute vessels so that the red color of the blood is not seen as distinctly as on most other mucous membranes. In most cases in health the color of the dorsum is a pale red; but in some diseases, it is nearly denuded of its elongated epithelium, its capillaries are distended, and it is a bright red. The red color of the blood shines through the smooth, flattened epithelium, giving it a raw, "beefy" appearance, often with a distinctly glistening surface. An increased redness above the ordinary normal occurs in some conditions of slight derangement; but an increase in the epithelial covering, and a consequent obscuring of the red color, is more frequent.

In health there are to be seen, at different points over the dorsal surface, little bright red elevations. These are small papillæ, with a constricted neck, enlarged at the extremity like a mushroom; and they are, therefore, called the fungiform papillæ. The epithelium covering these papillæ is very thin, and the blood shows through from the plexus of vessels in these projections. A net-work of terminal nerves, mostly those of the special sense of taste, is found at these points.

More numerous, and spread more evenly over the tongue, are the *Filiform Papillæ.* These are covered by thick epithelium, and do not present the red appearance; and as sapid substances would not as readily penetrate this covering, the sense of taste in the tongue is supposed to be chiefly situated in the fungiform, and not in the filiform papillæ. The soft red mucous membrane at the sides and back of the tongue, and on the palate and fauces, is also a seat of this sense.

When the epithelial layer over the tongue is thin, it will be more red; though this depends upon the quantity of blood in the capillaries; but when it is thick, a white or brownish appearance is presented. If there is a large accumulation of epithelium, soft and moist, upon its surface, an opaque dirty-white appearance is presented.

In the central part of the dorsum the epithelium covering the numerous filiform papillæ like sheaths is very long, resembling hairs in structure. Among these hair-like projections are often lodged particles of food, starch, and oil globules, etc. These epithelial filaments are composed of cells, new ones being formed at the surface of the filiform papillæ, while the older ones are at the extremity of the filaments. When these cells are rapidly produced and are firm and adherent, they constitute the basis of the "fur," or coat of the tongue. Sometimes they are piled up in large quantities and the coating is very thick. On microscopical examination immense numbers of spherical and oval particles are found among these cells, which are growing germs of organisms of different species, presenting different characters as they become developed. Some are fungi adherent to the cells, others are elongated, and evolve bacteria of various forms. These germ particles are probably produced by parents of different species, and from their rapid production and immense numbers they sometimes constitute a considerable portion of the coat. Not only among the cells, but upon the surface of the filaments, they are detached in groups, from time to time, and are swallowed in large numbers. The longer the fur remains upon the tongue, the older the cells, the more of these organisms appear. In many cases whole forests of these fungi appear covering the dorsum, and are more abundant in some morbid conditions than others. They are present, more or less, even on healthy tongues both of men and animals; but are much more numerous when the coat is more abundant. Germs of fungi are almost universally distributed, and when any matter is about to decay it is attacked by them; but their influence in producing the decay is not always accurately determined. Some of them, probably, have but little effect, while various facts show that others produce very decided effects, exciting and hastening the process of decay. Myriads are often swallowed without apparent injury; but under other circumstances, or from different kinds of germs and developed bacteria passing into the blood and tissues, specific diseases and great mischief may be induced.

Particular appearances of the tongue, from the earliest records of medicine, have been considered as indicating the conditions of other parts of the system, particularly other parts of the digestive apparatus. There is doubtless a special sympathy between all parts of the alimentary canal. They have a somewhat similar structure, are supplied with similar nerves, and those nerves are connected together and harmonized by intercommunicating cords. A morbid state of one part of the canal, however limited, affects more or less the other parts, however distant. Impressions from slight changes of food or drinks, from exposure of the surface of the body to cold and dampness, wetting of the feet, or even mental emotions, change the secretion of the stomach, very often causing, in a marked degree, its diminution, and at the same time changing also the action of other parts of the mucous surface, and of the glands—salivary, hepatic, and pancreatic—which pour their secretions into the digestive tract. The mouth is apt to become dry from these impressions, and the production of the epithelium on the tongue is increased, or at any rate it is not thrown off as fast as produced, and accumulates. The tongue thus becomes coated, and with many persons quite heavily, from slight derangements. In all fevers, even in slight feverishness, the tongue is more or less coated, but more in some persons than in others from a similar cause, so that although a coated tongue indicates derangement, the amount of coating is not always an accurate measure of the extent or severity of the derangement. Still, much can be judged from the state of the tongue, but it must be taken in connection with other symptoms.

When, from the imperfect action of any secreting surfaces or glands, secretions are diminished, matters are retained in the blood that should be eliminated, and the whole system is deranged from the wrong states of that all-pervading and all-essential fluid.

Disturbances of this kind are exceedingly common. When the first morbid impression is but temporary, the secreting glands, after a comparative rest, resume their action, and, stimulated by the increased quantity of material brought to them by the blood to be eliminated, their action for a time is often increased beyond the normal, but with the effect of restoring the blood and the tissues to the state of their ordinary purity, when all abnormal actions subside and health is restored.

In some cases nature is competent to do all that is required in a speedy and successful manner. She sometimes, however, fails in her efforts, and in most cases of this kind can be beneficially aided by art. In these conditions of feverishness with diminished secretions, with a dry mouth, throat, and skin, with diminished gastric secretion, and consequent loss of appetite, with constipated bowels, and perhaps diminished urine, the indications for treatment seem very obvious. The *first is, to remove the primary irritating cause, if still present and in action*—for example, to remove irritating matters from the alimentary canal, when such are still there ; *and the next is, to excite the secretions which have been diminished or suppressed.*

An emetic or a cathartic may answer a double purpose—removing irritating matters from the stomach or bowels, and exciting, in a decided manner, important secretions. A warm water, or hot air, or steam bath, by exciting perspiration, will often procure much relief. A few doses of chlorate, or nitrate, or bicarbonate of potash, or the liquor acetate of ammonia, by acting on the skin and kidneys, will also be useful. These means, or others of a similar character, one or more, according to the particular indications, can scarcely fail to procure relief and hasten restoration to the natural state. The influence of limited local irritations of the mucous membrane of the alimentary canal, communicated by sympathy, affecting secretions, corrupting the blood, and thus deranging the whole system, is frequently observed by the physician, and the young practitioner should bear this in mind and observe the tongue as a means of detecting these conditions. Not only its coated condition, by changes in the production of the epithelium and the accumulation of fungi, but its dryness or moisture, should be a subject of observation. Undue dryness is one of the most frequent changes of the tongue. Indeed, in the physiological condition, the amount of moisture of the mouth varies in different persons, and in the same person, at different times of day and night. Secretion of fluid takes place from the mucous surface as well as from the salivary glands, contributing to the moisture ; and the secretions generally, excepting that of the skin, are less in the night and during sleep than in the daytime and during waking hours. Sleeping with the mouth open, thus increasing evaporation when there is the least secretion, often causes unpleasant dryness of the tongue when no other cause exists. If other causes combine, the dryness may be very great. The moisture or dryness of the air breathed has an influence ; but, independent of these conditions, the secretion from its surface and from the salivary glands is diminished, and the tongue often loses its normal moisture. Among the causes producing this dryness are those already mentioned as affecting the secretions.

For palliating the dryness, water is taken, but its effect will be very temporary unless the secretion of moisture is restored. Glycerine added to the water, in the proportion of one part to five or six, will be less temporary in its action in relieving the dryness; but the main object in treatment should be to restore the secretion.

For this purpose removing the cause of the disturbance is most important; but some special means may be used to increase the buccal, lingual, and salivary secretions. The presence of any mechanical irritant in the mouth, as a pebble, or chewing a twig, a piece of lemon or orange peel, etc., will increase the salivary secretion by reflex action.

There are various sialogogues, such as horse-radish, mezereum, ginger, sweet flag, etc., which taken into the mouth more actively promote the secretion of saliva. Some salts, as the chlorate of potash, nitrate of potash, bicarbonate of potash or soda, the latter especially, compressed into lozenges or pellets, and allowed to dissolve slowly in the mouth, increase the flow of the moisture. Linseed tea, flavored with lemon-juice and sweetened with glycerine, sipped occasionally, will relieve the dryness.

Very small doses of mercury will act more permanently in increasing this and many other secretions, besides tending by their eliminative action to remove other pathological conditions likely to be present; and in cases of any considerable continuance it should be prescribed. Judiciously used it is innocent, and in many cases of slight as well as of more severe disease it is the most efficient of remedies. A grain or less of calomel, or one, two, three, or more grains of blue pill or hydrarg. cum creta, repeated a few times at intervals of one, two, or three days, generally followed by a laxative, will give remarkably satisfactory results. The iodide of potassium in small and repeated doses will also quite certainly induce this secretion. It is in some cases preferable to any of the other articles.

The tongue in some rather mild ailments has a *white, moist, thick fur* upon it, consisting of proliferated epithelium, mucus, bacteria, fungi, and the débris of food. In rheumatic fever this condition is common; but here it will require only the treatment adapted to this disease. A mild mercurial and saline cathartic may, however, well precede the more specific treatment for the rheumatism.

In *anæmic* states the tongue is usually flabby and pale, and retains the impression of the teeth. Where, however, the gastric membrane is inflamed in this anæmic condition, the tongue will be more dry, and sometimes red.

In slight chronic rheumatism, and in some temporary derangements of the stomach, the tongue has a thick, moist, extended, and what has been termed a blankety fur.

The tongue of inveterate smokers is always dirty (Dr. Beale); and some persons in tolerable health always have a foul tongue. In smokers it is usually accompanied with a horribly offensive breath; and wherever it is coated the breath is apt to be bad.

Some persons, whatever their ailments, never have a coated tongue. In these it is naturally somewhat fissured, and often presents a red appearance.

In contrast with the blankety tongue is a *bright red tongue*, seen in some fevers, especially in scarlatina. In acute gastritis the edges of the tongue are almost always red, though the centre may be covered with a fur. The redness, however, often spreads over the whole surface. This appearance seldom occurs in slight ailments. In cases of chronic gastritis, the tongue is often patchy or mapped in appearance, some spots clean and smoother, and others furred. This appearance is indicative of disease of considerable standing and of some severity, though the patient may be on his feet.

A raw, beefy appearance of the tongue is often observed toward the close of exhausting diseases, sometimes with irregular patches of fur or aphthous spots upon it, and, in some cases of pyæmia, the tongue is red, or dark, dry, contracted, and hard.

The *dry brown tongue* is often observed in low typhus and typhoidal fevers; but for a fuller description of its appearance, and for the sordes gathering on the teeth, reference is made to the articles on those diseases.

Chronic cracks and *fissures of the tongue,* sometimes pathologically occur in persons of weak digestion and with morbid conditions of the stomach. It is often rather pale, though sometimes redder; is quite moist, and at times becomes covered with a white fur, which may be distributed in patches. The cracks are more or less deep, the islands of different sizes and shapes, and the fissures, sometimes extending through the mucous coat, may bleed and become very sensitive and painful. A milder form of this same condition is not very uncommon. The stomach is sensitive, and can bear only bland food and medicines; the bowels often sluggish, with other evidences of dyspeptic symptoms. The general treatment is the same as that for dyspepsia (see article on that subject), and, locally, a lotion of carbolic acid (one part to one hundred of water) with other astringent, antiseptic, or soothing applications, according to the particular conditions, may be required.

In some more chronic and obstinate cases less dependent upon disease of the stomach, where there are cracks and fissures, but with some portion of the surface too smooth and shiny, free from any projecting epithelium, the principal remedy, according to Dr. Lionel Beale, is iodide of potassium. By this remedy, he asserts, it is usually relieved, and, in not a few cases, cured. The remedy he directs must be taken in doses of two grains, two or three times a day, gradually increased to five or six grains, dissolved in as much as half a pint of water, continued for two, three, or more weeks; then suspended for a short time, and resumed again. Some cases, the same author says, improve more rapidly on iodide of mercury, or from the thirty-second to the sixteenth of a grain of perchloride of mercury, with five grains of iodide of potassium and a little syrup of ginger, and perhaps with twenty minims of Battley's liquor cinchonæ in four ounces of water, twice or thrice a day for two or three weeks at a time. Some of these cases may be syphilitic in their origin, when these medicines will be particularly indicated; but Dr. Beale contends that they are efficient in cases where syphilis has no share in their production.

Somewhat similar fissured and chronically changed conditions may extend to the throat, and even to the larynx and trachea, or to the posterior nares, affecting the voice and respiration. The mucous membrane is glazed, red, and dry, and has lost that peculiar sensitiveness which, in the natural condition, causes a reflex attempt at swallowing whenever the part is touched. This benumbed sensibility lasts only while the disease of the surface continues, and when the morbid condition just beneath the epithelium is removed, the nerve fibrils distributed there in great numbers resume their normal activity.

The general treatment of these conditions is to be conducted on the same principles as where the tongue alone is the seat of the disease; and besides, various local remedies are to be used, such as the application of glycerine and tannin, solutions of nitrate of silver, of chlorate of potash, of alum, etc., by a soft sponge, a camel's-hair brush, or in the deeper parts by spray. In using the spray the solution should be filtered to prevent clogging up the tube of the spray producer; or, what will answer the same purpose, the tube which dips into the solution may have tied over its end a piece of close-textured muslin. But the diseases of the mouth and throat are more particularly considered elsewhere.

Metallic and other *tastes* in the *mouth* are expressions of general rather than of local derangement, and require a mention among the slighter ailments. Very peculiar tastes, in the absence of any sapid substances, are sometimes complained of and described as metallic, salt, acid, sweet, bitter, and sometimes as fecal. These are sometimes clearly dependent on derangements of the stomach, and may have the character of rancid butter, butyric acid, valerian, etc. By correcting the conditions of the stomach and bowels, and by exciting the secreting organs, these unpleasant conditions may generally be relieved. Small doses of mercurials with laxatives, alternated with diuretics and diaphoretics, aided by exercise and the warm bath, are indicated.

Offensive Breath, when not dependent on decaying teeth or ulcerative or gangrenous conditions, is for the most part produced by similar causes, and requires similar treatment.

Removing constipation, improving digestion and nutrition, will require attention, and various eliminatives—cholagogues, cathartics, diuretics, and diaphoretics—are called for.

Mercury, says Dr. Beale, is of the greatest service if used with judgment and due care. It acts especially on the liver, and also causes increased action of all the glands connected with the alimentary, and probably the absorbent system. He adds: "I think our fathers gave it too frequently, and in unnecessarily large doses, but now I think we err in an opposite direction."

But various other eliminative medicines will be found useful, and some local remedies will palliate the symptoms. Charcoal powder, mixtures of camphor, weak solutions of carbolic acid, Condy's fluid, tincture of myrrh, etc., are among these agents.

The exceedingly foul breath, so often produced by free smoking, admits of only one remedy—abandonment of the pernicious habit. Other odors may, if strong enough, partially cover it, but it arises from destruction and putrefaction of organic matter, mostly of the blood, mingled with the odors of the tobacco, and they pass off, not so much from the mouth as from the lungs, and it can scarcely be reached and palliated by any remedies. The inveterate smoker must submit to be a nuisance to those around him, if not to himself, as one of the penalties of his indulgence. The same may be said of the drunkard's breath when it gets beyond the alcoholic into the putrefactive smell. But these can scarcely be classed among the slight ailments.

Impairment and Loss of Appetite are symptoms of various diseases of greater or less severity, but sometimes they occur as the chief and almost only recognized morbid condition. When diminution of appetite occurs as a symptom of various diseases, it is usually an evidence of diminished digestive power, and is often conservative and useful in its results. When it depends on inflammation or a congestive state of the stomach, it is better that food, except in very small quantities, for a time at least, be abstained from. When the result of a surfeit, the fasting it induces allows the stomach a rest which it much needs, and is likely to result in recuperation. Some who boast of an unfailing appetite would be the better for its occasional loss.

In many cases, then, the attention of the physician should be directed, not so much to the loss of appetite as to the morbid condition inducing it. This, to some extent, should be the case always; but sometimes direct means to increase the desire for food should be used.

In cases when the stomach is fairly healthy, but when, from weakness, great fatigue, too much brain work, anxiety, fear, joy, or other strong mental emotions, the appetite is lost and food is neglected, the weakness is increased by abstinence, and the appetite may often, with propriety, be stimulated. The articles most used for exciting an appetite are the vegetable bitters and aromatics, infusions or tinctures of colombo, cascarilla, gentian, orange peel, quassia, ginger, etc. Small doses of quinine, strychnia, or salicine, the mineral acids, the use of spices, capsicum, mustard, pepper, allspice, and the like, are useful. In some cases a complete change of diet, and even of scenes and associations, will be required.

Beer and wine in small quantity, especially in those accustomed to their use, are said to increase often the desire for food. Alcoholics may occasionally have that effect with others.

The principal thing, however, is to search for and remove the cause, whatever that may be.

The loss of appetite depending upon more established dyspeptic conditions and upon hysterical states, is considered in other places.

An *Excessive* or *Voracious Appetite* is sometimes met with. The person eats enormously, but is never satisfied. As stated in another connection, this is sometimes the result of bad management of children, or of gluttonous indulgence in adults.

This Bulimia, as it is called, may be produced by morbid irritation of the stomach, and not unfrequently by the presence of worms. A craving appetite is sometimes felt when there is some obstruction to the absorption and appropriation of food, or when the food is transformed into unnatural products and carried out of the system without affording the proper nourishment. It is then an expression of inanition, or a want of food in the blood and tissues. Thus, in obstruction of the lacteals or thoracic duct, and in diabetes, hunger is felt which can with difficulty be appeased, as the food is not satisfactorily appropriated. It is the food properly digested, absorbed, and appropriated, and not always the amount taken into the stomach, that appeases hunger.

In these cases the remedies should be directed to the causes when they are remediable.

Over-indulgence of the appetite, even when the food is digested and appropriated, is far from increasing force. Some who take a too exclusively physical and chemical view of the animal system, regard it as they do a steam-engine—where the more fuel is consumed and applied the more force is evolved. "This," says Dr. Beale, "is a principle which, if correct as regards machinery, is certainly untrue when applied to living organisms, and devoid of all foundation as regards man." In accordance with this purely mechanical philosophy—which I can but agree with Dr. Beale in believing erroneous—every transformation of material in the body produces an equivalent amount of force, and, if not heat, it must produce some other force, muscular, mental, etc. If this were true, a man could do work in proportion to the food he digests, and the amount of alcohol or other materials that may disappear and be transformed in his system. This, by observation and experience, is found not to be the case. Alcohol, though it disappears to a limited extent in the system, certainly does not increase heat, and unless indirectly, by relieving shock, it does not seem to increase force; and in cases where it appears to increase activities, a quarter of a grain of morphine or a couple of grains of quinine, which certainly cannot act mechanically or chemically from transformation, is quite as likely to do the same thing. In fact, when more food is taken than the system needs, however perfectly it may be oxidized and transformed, oppression and weakness, rather than increased strength, is the result. The excreting organs have a severer task and an increase of labor to perform to get rid of the superfluous material, but all other activities are diminished. The animal body is not a mere mechanical machine subject to gross chemical and physical laws alone, but it is a living organism with capabilities of responding to impressions and of exerting force without a necessary corresponding amount of combustion or transformation of either food or tissue.

There is a physical basis of life, there are physical and chemical elements and principles present and in operation, and a physical structure which must be kept in repair, but there is a life element, which if not essentially different in its nature, is yet so peculiar in its action as not to be in all respects subordinated to, and in details dependent upon, physical and chemical conditions. In none of our present crude theories respecting living beings can the distinctive character of the life susceptibilities and life actions be ignored. The recent experiments of Dr. Brown-Séquard and others, as well as immemorial observation, tend to disprove the more mechanical and chemical theories of life.

According to observations among the English "Railway Navigators," as they are called, selected from the strongest and most vigorous men, whose high wages enable them to pamper and indulge their appetites, and who often consume enormous quantities of animal food, they, as a rule, become damaged and broken down before the age of forty, indeed, are seldom seen as old as that, often passing into states of disease which destroy life early. "Like the popular philosopher, he adopts the absurd theory that the more he eats the more work will he be able to do, and unfortunately acts upon it, squandering his money in beef and beer that strain his organs of digestion, assimilation, and secretion, and ruin his health." (Beale.)

On the other hand, men of the working classes, who live moderately, are often very strong and vigorous, and able to do good work at the age of sixty-five or seventy, and even later; men who, like Shakespeare's Old Adam, had led active but virtuous and temperate lives, and with him could say,

> "For in my youth I never did apply
> Hot and rebellious liquors in my blood,
> Therefore my age is as a lusty winter,
> Frosty, but kindly."

In the treatment of cases of inordinate appetite from irritation of the stomach, as from worms, etc., the cause must be removed, and soothing measures applied. Small doses of hydrocyanic acid, fifteen or twenty grain doses of carbonate of soda in solution half an hour before meals; or the liquor potassæ, or bismuth, or henbane, or opium in small, cautious doses, etc., will allay irritability of the gastric nerves. In cases of habitual excess of appetite and eating, the diet must be regulated by rules, and the appetite will in time accommodate itself to what is best.

Nausea is a condition usually preceding and accompanying vomiting, and is allied to anorexia. There is, however, a distinction between nausea and vomiting, and between nausea and simple loss of appetite. The causes of nausea are various. Besides those which acting in greater force produce vomiting, there are those which sometimes keep up a protracted sense of nausea without emesis ever occurring. Some persons in high altitudes, as in visiting the mountainous regions of Switzerland, have an almost continued sense of nausea, which may be relieved for short periods by the taking of food. In these cases it appears to be produced by the diminution of the accustomed atmospheric pressure.

Various medicinal substances, the motion at sea, or with some the motion in a carriage or railway car, or riding backward, or certain articles of food, or disgusting substances or even disgusting thoughts, etc., are well known causes of this sensation. Some cannot endure the smell of tobacco smoke without that feeling. But nausea may be produced by irritation of the mucous membrane of the stomach from disease there ; or by morbid conditions elsewhere affecting the stomach by sympathy or reflex action. Congestion of the portal circulation, regurgitation of bile into the stomach, various slight morbid states as well as more grave diseases, may cause this sensation.

The *Treatment* cannot be specific and empirical in this, any more than with other morbid symptoms depending upon a variety of causes and occurring in various conditions. The causative indication must be fulfilled wherever it can be discovered and reached. This may require a variety of measures. The regulation of the secretions, the administration of a cathartic, sometimes even the operation of an emetic, will be useful. A blue pill, followed by a laxative, will often, as in many other similar derangements, be most satisfactory in its effects.

In some cases spices, spirits of ammonia, or effervescing mixtures, carbonic acid waters, aromatics, or bitters, will relieve the sensation. Counter-irritation or revulsives—a mustard plaster over the stomach, or a cloth wet with warm water and covered by oiled silk, a pediluvium, or a general warm bath, will often do good. Abstaining from food for a meal or two, or changing the diet entirely, may succeed. The administration of small doses of *ipecacuanha* will sometimes relieve promptly the sense of nausea. The homœopathists claim this as an illustration and proof of their alleged law of *similia similibus*, and it is suggestive of a principle of counteraction which has a certain range of applicability ; but these small doses of ipecac fail quite as often as they succeed in arresting nausea, and are by no means specifics against this symptom. Opium, camphor, and other anodyne or narcotic substances, will often succeed when other means have failed. Among these, hydrocyanic acid, in careful doses, is quite conspicuous.

Thirst, when physiological, is the natural expression of a deficiency of fluid in the system, but as a pathological symptom, it is the result of various morbid states. There is usually thirst in all fevers, and it is apt to be specially marked in inflammation of the stomach and throat. In profuse watery discharges, as in cholera and diabetes, and in free sweating, it is apt to be intense ; but it may occur as the most marked phenomenon of a case, and can properly be placed among the minor ailments.

Some people habitually drink too much water. This is the case not unfrequently with children, not so much from any morbid thirst as from a bad habit. Some, on the other hand, drink too little, and are greatly benefited—their secretions increased and their systems washed out—by a course of free water-drinking.

Thirst and indulgence in too free drinking, diluting too much the gastric juice and the blood, and imposing too great a task upon the secreting organs, sometimes results from some local irritation of the mouth and throat and deficient secretion of the mucous membrane. The habit of constantly ejecting the saliva arising from the disgusting practice of chewing tobacco, or from other causes, may lead to inconvenient thirst, which, however, should be gratified, in order to supply the loss of fluid; and it is fortunate if it be so with simple water. In the management of all the cases that require for this symptom any treatment, the cause must be looked for and removed. When from local dryness of the mouth and throat, the secretions of the part should be increased by the means already pointed out. When, from active exercise in traveling or labor, there is an inconvenient or painful thirst, without the means at hand for gratifying it, or where its gratification would lead to the ingestion of too much fluid, the taking of a pebble into the mouth and moving it about, or the chewing of a bit of orange peel, or even a twig, will often give relief.

For the gratification of a normal thirst, pure water is the natural and best article. The various additions to it, made to gratify the taste or for producing other effects, seldom improve its efficacy in allaying thirst, and generally render it less wholesome and safe. The practice of taking other drinks than simple water, especially those having strong sapid qualities, impairs the natural appetite, and often destroys the relish for pure water. This is an unfortunate event, as it often leads to indulgence in drinks dangerous and destructive. Carbonic acid water is often resorted to for the quenching of thirst, but, in most cases, it is less efficient than simple water, especially if flavored syrups be added to the effervescing fluid.

The temperature of the drinking water is a matter of consequence.

With Americans it is quite the custom to take ice-water, and it is regarded by some as an injurious practice. It is certainly agreeable in the heated season, and, when indulged in with proper moderation, is not, as a rule, injurious. A less quantity is required to allay thirst than of water of a higher temperature, and its use, in moderation, is to be encouraged. Drinks, decidedly warm, especially in connection with meals, agree with some persons of weak digestion better than those of a low temperature. Tea, coffee, and chocolate are those commonly used, but all of these articles have qualities rendering them other than simple diluents or thirst-allaying drinks. They impress the nervous system unnaturally, and often injuriously. In cold weather cold water seems not to agree with some, and in such cases hot water and a little milk and sugar, or some simple vegetable infusion destitute of anything but a little flavoring or nutritious properties, may be taken with advantage.

One confining himself exclusively to simple water as a drink, not however excluding milk as both food and drink, will relish water much more than those who even occasionally indulge in more sapid articles; and there can be no doubt that the simple water-drinker is in the most natural, most physiological, and safest condition. His enjoyment of drink is not less, and his prospects of health and life are better.

We have very ancient, and many will believe excellent, authority for saying that "Wine is a mocker, strong drink is raging, and whosoever is deceived thereby is not wise." (Solomon.)

Many of the moderate and temporary *Indigestions* might be classed among the slight ailments, and be considered here; but the whole subject is treated together in another connection.

Various headaches, too, might be classed among the slighter ailments, but may be better treated of in connection with other and more grave affections of the nervous system. So with the slighter and more transient neuralgic and rheumatic difficulties. They may better be treated of with the graver cases of the same disease.

There are very great differences in different persons as to the amount of nervous impressibility, and the suffering from that cause, independent of actual disease. Painful susceptibility to slight morbid impressions, though entailing much discomfort, and even decided suffering, may be more favorable to the health and longevity of the individual than that insusceptibility and sluggishness of nerve action which will allow morbid processes to go on unrecognized by the sensibilities, until real structural changes have taken place and serious diseases are established. In the one case of highly active nerve organs, illness is prevented or is self-cured before it progresses to serious results. In the other, a morbid process may be unperceived, and consequently neglected, until remedies are ineffectual. The importance of attending to diseases of almost every kind in their early stages cannot be exaggerated. Remedies, then, often need to be much less active and complicated, and are almost always much more efficient than when deferred to a later period.

Drowsiness on the one hand, and *Wakefulness* and *Restlessness* on the other, are not unfrequently complained of as the principal symptoms noticeable. They are sometimes apparently dependent upon imperfect action of the digestive organs, upon associated impurities of the blood, and sometimes upon primary derangement of the nerve-centres. Drowsiness may often be traced to over-feeding, or to the use of beer and wine. When this is the case, correction of the habits is called for. Frequently it arises from imperfect action of the liver and slight jaundice. In many cases eliminatives are needed—cholagogues, cathartics, and diuretics. The often-abused blue pill, followed by saline laxatives, the doses repeated a few times at intervals of two or three days, will frequently remove the difficulty. A shower bath soon after rising in the morning will often arouse the patient.

When the difficulty is at the nerve-centres, its special character must be inquired into and treated accordingly. It may arise either from congestion or anæmia of the brain.

Wakefulness and restlessness may arise from a variety of causes. Not unfrequently the excitement of business or of mental labor, often carried to the point of fatigue and exhaustion, produces the effect. At other times it may be traced to the use of free quantities of tea or coffee. When it arises from over-excitement and mental fatigue, withdrawal from business for a time, rest in the country, or diversion of some kind will be required. Moderate but not great muscular exercise in the open air may be prescribed, and the diet properly regulated. The bath, of various temperatures adapted to the case, will often soothe and aid other means. Any organs improperly performing their functions should be regulated, and all injurious habits corrected. Narcotics or soporifics to directly induce sleep should be resorted to with much caution, and should generally be avoided, lest a habit of dependence upon them be contracted. Of these articles, opium and alcohol are most dangerous, and bromide of potassium and valerian perhaps least so. An occasional resort to some of these articles may be justifiable; but the long-continued use, especially of the two articles first named, is disastrous.

Nervousness is a term frequently used, but often without a very definite signification. It, however, indicates a morbid nervous impressibility, and some degree of irregular nervous action. The particular phenomena produced by this state are various, and so also are the causes of it. The mind, especially the emotions and the temper, is disturbed, and sometimes even the intellect suffers. Sometimes these conditions may be traced to perversions in the functions of the various organs, abdominal and pelvic, but in other instances the phenomena appear to depend upon a highly sensitive or excitable state of certain parts of the central nervous system, upon a wrong functional action of some portions of the brain. With some, such conditions are constitutional and hereditary, but they are induced and aggravated by the excitement and influences of our civilization. Some cases are produced, while others lead to and are aggravated, by indulgence in various stimulants and narcotics. Tobacco, strong tea and coffee, and alcoholic beverages, though often producing temporary relief to present symptoms, are injurious in their ultimate and often in their immediate effects, increasing the difficulties which they sometimes, though not always, temporarily abate.

Too much mental cultivation and excitement in certain directions, with too little muscular exercise and development, tend to these results.

Dr. Beard, of New York, suggests that our present American nervousness is due to the abandonment of the use of pork! But the cause must be sought in something more profound, more radical, and more rational than this.

Overwork of the brain is doubtless injurious, as is every excess; but other persons than brain-workers are sometimes exceedingly nervous, and too little mental exertion is as likely to be followed by nervousness as too much. Dr. Beale, of London, expresses the opinion that, as a fact within his observation, more disease is produced by too little brain-work than by too much.

This nervousness often occurs in connection with functional, and sometimes with organic, diseases of the heart. Not unfrequently examination will show oxalate of lime in the urine, or evidence of other derangement of the system. In other cases no other derangements than the nervousness can be discovered.

It is difficult to say how such nervousness should be treated. Those cases connected with other morbid conditions and produced by them, must, of course, be treated for those conditions.

The constitutional and idiopathic cases scarcely admit of medication. Proper hygienic and moral management may diminish the manifestations of the phenomena; but most will depend upon the self-control of the patients themselves. Yielding to impressions and following wayward impulses, or noticing and dwelling upon peculiar sensations, will increase them, and they should, as far as possible, be ignored and resisted. The petting and indulgence of young persons often cultivates this nervousness. Travel, change of climate and scenery, the breaking up of old associations and the forming of new ones, and especially returning to more simple and less artificial modes of living, getting as near as possible to nature, and, while having motives and occupation, avoiding too much excitement and worry, will do what can be done for overcoming these constitutional nervous states. When recognized morbid conditions of the nerve-centres are present, treatment adapted to these states will be required. The bromides will often produce palliative, and sometimes more radically curative effects. Various nerve tonics, such as nux vomica, oxide of zinc, quinine, arsenic, iron, etc., may, in some cases, improve the general condition and be useful. Debility and anæmia tend to increase nervousness, and, when present, tonics are often required.

What are called *Rheumatic Pains* are not unfrequently complained of by various persons. These pains affect various tissues in different parts of the body. They seldom cause any general feeling of illness, at least of a very decided character; they are sometimes twingeing and transient, exaggerated by certain movements, but are sometimes fixed for considerable periods in particular parts, especially about joints, in various fibrous and muscular structures, as in the back, about the neck, etc. Pains occurring sometimes in children or youths are called Growing Pains. In most American women they are called Neuralgic, but in men, especially those advanced in life, they are called Rheumatic. Their position in nosology is by no means well defined, and a knowledge of their pathology is not established. In different instances their pathology probably differs. A neuralgic element is often present, but they differ from purely neuralgic pains by not following the course of nerves, by being aggravated more by movement, and by being situated in fasciæ, ligaments, tendons, and muscles. There is usually, or at least often, deficient elimination of effete matters from the system, a deficiency of urea in the urine, while urates are more abundant, and not unfrequently oxalate of lime is found in that secretion. These rheumatic pains are exceedingly common among the beer-drinking people of England, the dampness of the climate having something to do with its production, but beer also, as it is asserted that the sufferers who give up their beer almost invariably improve.

Lumbago, a muscular or musculo-fibrous rheumatic pain and soreness in the back, is one of the worst forms of this unpleasant affection, sometimes confining the patient to his bed or couch for days or even weeks. The pain in different cases appears most severe near the insertions of muscles. The organic or non-striated muscular tissues, as well as the voluntary, may be the seat of these pains. The reason why the pain in the muscles is severest and most frequent near their insertions, in their tendonous parts, may perhaps be that the blood, circulating more slowly at those points, gives more opportunity for the passage of irritating matter from it to the tissues. More or less exudations doubtless take place, and in the firmer structures press more upon the ramifications of the delicate nerves everywhere distributed, thus causing the greater pain. The long continuance of these pains in particular parts causes thickening of the tissue from exudations or proliferations, and parts may thus become more seriously and permanently impaired. In some cases joints become immovable, and the difficulty can be no longer included in the sphere of slight ailments. In the early stages, however, the pathological change is so slight that we are unable to say positively what it is. Probably, however, some irritating material from the blood is exuded into the tissues and invades the sensitive nerves. The disuse of muscles which the pain and soreness causes sometimes results in wasting and contraction, with their attendant slight deformities. Some cases thus approach to the much more grave affection which has received the name of Rheumatoid Arthritis, and which is considered elsewhere.

Before commencing *treatment* many of these cases require careful investigation. The history of the case, the habits of the patient, the influences to which he has been subjected, and all the present conditions of the system, especially the quantity and state of the urine, should be ascertained. On the theory, which is most rational, that impurities of the blood are concerned in the production of the phenomena, eliminatives are called for ; and they are found by experience to be most useful. The intestines and the glands pouring their secretions into them, the skin, the kidneys, and the lungs are the principal blood-purifying organs. Their eliminative functions should therefore be increased. A dry atmosphere favors elimination from the skin and the lungs, and this is well known to be favorable to these rheumatic patients.

Exciting the skin to increased action by the warm-water bath or the Turkish bath, is often of great use in these cases, and should not be neglected as an element of the treatment. The body must be protected from exposure and chill after their use, and flannels with other proper clothing are important. The bowels should be kept free, and in fact, should be frequently acted upon by saline eliminative laxatives or cathartics. For this purpose we have no better article than the Rochelle salts. Besides its eliminative action upon the bowels and kidneys, its alkaline effect upon the blood is produced by the decomposition of its organic acid, leaving its base free in that fluid.

Various diuretics are useful, particularly the saline and alkaline, though some of the vegetable may often be added with advantage. Alkalies, to a certain extent, are doubtless useful, but given too largely, or continued too long, they may injure the stomach, interfere with digestion, cause phosphates to appear in the urine, produce great debility, and thus do more harm than good. When prescribed and followed by relief, patients may go on with them for a long period without further advice until much mischief is done. The alkaline salts with organic acids are less likely to interfere with digestion, but these may be carried too far.

In many cases guaiacum may be added with much advantage to other treatment. It is an agreeable stimulant to the stomach, acts upon the skin and other excreting organs, and is supposed to have some specific action upon the rheumatic state.

Salicine, salicylic acid, salicylate of soda having a very marked and specific effect in acute rheumatism, are worthy of a trial in these milder chronic forms. Quinine will sometimes be found useful, especially where there is a neuralgic element, and a debilitated condition. In some of these neuralgic cases the bromide of potassium will give relief.

The alterative and eliminative effect of iodide of potassium in many of these cases is very marked and beneficial.

In recommending it in these cases Dr. Beale remarks: "Both the iodide of potassium and the bichloride of mercury (from one thirty-second to one-sixteenth of a grain for a dose) are extremely valuable remedies in very many affections, which are not in any way due to syphilis."

Occasionally free sweating at night occurs spontaneously in these cases, and is kept up for a considerable time, with very great relief to the symptoms—a method of nature's cure.

The diet should be nutritious, but much animal food should not be taken, and simple water, *freely used*, should constitute the principal drink. There is now a general agreement that all alcoholics, especially beer and acid wines, should be scrupulously avoided.

The subject of rheumatism is treated of elsewhere; but these cases are of doubtful pathology, and are certainly quite different from genuine or acute rheumatic inflammation. Many of the cases differ from what is properly called muscular rheumatism, though others approach and are merged into that disease. The morbid material in the blood, in all these cases, is probably different from that of acute articular rheumatism.

Bites of Insects.—The irritation and circumscribed inflammations produced by the *bites* of *insects* may properly be classed among the slight ailments, and are worthy of a brief notice. The bite or sting of the mosquito and flea are typical, and that of the flea particularly has been studied with care. As light is often thrown upon more grave and extensive diseases by a knowledge of the more slight and limited, a better knowledge of erysipelas and other inflammations may be obtained by a study of flea-bites.

The introduction of the lancet of this little insect through the cuticle, and into the living matter of the true skin, wounding the formed matter of cells and penetrating minute vessels, and, withal, depositing a minute quantity of acrid matter in the tissues, excites an inflammation somewhat specific in character, and generally abruptly limited in extent. The question arises as to how this is effected, and what are the particular changes which occur in the production of the result? Every cell in the living tissues has an external surface of formed material, or a cell-wall without, and a more highly vitalized bioplasm within. In the natural condition, in the nutrition of the living cell, the nutrient matter passes slowly through the firmer cell-wall to the bioplasm, and changes are gradually produced. When a cell-wall is penetrated by the lancet of the flea, exposing the bioplasm of the cell, nutrient material is speedily taken in and appropriated, and a rapid but morbid cell growth takes place. These cells then become embryonic, undergo rapid change, and frequently become pus corpuscles, many of which may thus be quickly produced. Where irritation and excitement exist, an increased quantity of pabulum is exuded from the blood-vessels and lymphatics, it accumulates, and speedy nutritive, but pathological, changes take place. The superabundant pabulum, appropriated by the bioplasm, is thus prevented from undergoing putrefactive changes, and inducing death of surrounding parts.

When in an inflammatory process the vitality is too low to cause these growths and multiplication of cells and the production of pus, mortification is the result. But in all ordinary forms of inflammation of a decided character, the bioplasm of cells increases, gives off diverticula, which become detached, form separate portions of living matter, that in turn grow and give off more processes, until from a few particles of irritated bioplasm, liberally supplied with pabulum, numerous embryonic cells, many becoming pus cells, result.

Though leucocytes are exuded from vessels and present themselves as pus corpuscles, I can but think that, in the ordinary process of suppuration, the chief production of pus is from the multiplication and transformation of the cells of the tissues involved. In these small injuries effected by the flea the process is limited, and suppuration, at least to any considerable extent, is not established. But what really takes place here upon the surface, and subject to observation, is of much interest and is worthy of attention.

The wound of the small vessels allows a minute quantity of blood to pass out into the tissue, causing a deep red point, which does not disappear on pressure, called a petechia. Around this, however, is a less intensely red area, which is the result of accumulation of blood in distended capillaries, and which does disappear on pressure. This red blush does not gradually shade off into the natural color of the surrounding skin, but terminates abruptly in a circular patch from one-eighth of an inch to something more in diameter. All blood-vessels, the smallest included, are surrounded and supplied by minute branches of nerves, which exert an influence upon them, causing contraction or dilatation according to the character of the influence exerted ; and doubtless the dilatation of these small vessels is due to the action upon them of nerves which have been irritated by the wound inflicted by the lancet of the flea, and by the poisonous material introduced in the operation. Some of the small nerve-fibres are cut off by the proboscis, others are paralyzed by the poison, their influence in contracting the small vessels is diminished or destroyed in the limited area of the extent of these minute branches, and the dilatation and redness continue for some hours. Pressing the blood out until the part has the pale color of the surrounding skin, it returns again, until the morbid impression upon the nerves has exhausted itself, and their functions have been restored. The vessels then contract to their usual size, the effused blood and exudates are absorbed, and the healthy condition is restored.

In severe and more extensive inflammations from more potent causes, other local results follow, which have already been sufficiently described.

In many instances the results of the local injury are widely extended. Even the inflammation of a flea-bite, in some conditions of the system, may spread, and the general organism may respond in morbid actions. In the severer inflammations, as in erysipelas, a poison often becomes introduced into the blood; so that the whole mass of nutrient fluid is changed, and through it every organ and tissue of the body may suffer. The sting of a bee or wasp produces much more effect than the bite of a flea, but of a similar character, and other causes of inflammation, operating on a larger scale, produce more serious results. Specific poisons, producing definite forms of disease, are communicated in different ways, and produce their peculiar effects. The flea-bite, and the little area of inflammation showing itself at the surface, illustrate the subject of inflammation occurring elsewhere, and on a larger scale. An injury is inflicted, the tissues and nerves are morbidly impressed, the vital activities are changed, and various diseased conditions result. The same injury will produce very different degrees of morbid action, depending upon the susceptibility of the system, the power of resistance, the effect of previous impressions, etc.

The *Treatment* of the bites and stings of insects is a matter of some moment. As the poisons they inject are thought to be of an acid character, the use of alkaline applications is indicated. Solutions of ammonia are used, and often procure quite marked relief of the itching, the pain, and inflammation. The application of spirits of camphor, or tincture of arnica, etc., is also useful. Anything more than this local treatment is seldom required, as the inflammation generally soon subsides.

Moderate Capillary Hemorrhages, particularly from the nose, not unfrequently occur, especially in young persons, and may be classed among the slighter ailments. The nasal mucous membrane is very delicate, and numerous capillaries and small arteries and veins are near its surface. More extended transverse ruptures and longitudinal openings or slits in these small vessels occur, and the blood pours forth. This is sometimes the result of violence, sometimes of plethora and an active determination of blood to the part (when the hemorrhage is often relieving), and sometimes it is due to a feeble and relaxed condition of the tissues of the vessels.

The ***Treatment,*** when so severe as to require interference, is divided into that which is applicable to arrest the flow, and that given during the intervals, to prevent its recurrence. The most speedy and generally effective method of arresting the flow is to seize the nose between the thumb and finger, embracing the extent of the cartilage and as near the nasal bones as possible, and press sufficiently to bring the internal surfaces together throughout the whole cartilaginous portion of the nostrils, and firmly and constantly hold them thus for a few minutes, or longer, as may be required. This very seldom indeed fails to arrest the bleeding. Should it continue, the blood passing out at the posterior nares, other means may be resorted to. The patient should maintain an erect position, sitting or standing, cold water, solutions of alum, or other astringents, may be snuffed up or thrown into the nostrils, cold water may be suddenly applied to different parts of the body to cause shock, the expedient of holding the hands above the head may be tried, and, as a last resort, the nostrils may be plugged anteriorly, and, if this is not effectual, posteriorly also, by proper surgical means.

To prevent the recurrence of the hemorrhage the general condition of the system must be considered. If it depends upon plethora, constipation, determination of blood to the head, or local disease of the Schneiderian surface, these conditions must be remedied. If it depends upon a feeble and relaxed condition of the tissues and a thin state of the blood, tonics, preparations of iron, etc., will be required. The habit—if a habit of bleeding occurs—should be broken up as soon as possible by not allowing the flow to continue when the bleeding takes place; and the consequences of the loss of blood must be remedied by iron and a good diet.

There are various forms of limited and transient inflammations which might be treated of among the slight ailments, but many of them are surgical, and all are to be managed in accordance with the principles which have already been pointed out.

The only remaining condition to which attention will be called under this general head is that of "Taking Cold" and Coryza. An ordinary cold is the most common and best known of all slight ailments. Moderate irritation and congestion, often slight inflammatory and mild feverish conditions are present, and the phenomena, though less in degree, are similar to those of the severer inflammations and fevers. These phenomena are too familiar to require minute description. After some exposure to cold and damp, or the sudden checking of perspiration (though sometimes without any appreciable cause of the kind), some chilliness is often felt, with a sense of heaviness, and frequently some general pains; but in other cases the first that is observed is an irritation of the Schneiderian membrane, inducing sneezing; or the throat is irritated and a cough is induced. The temperature increases one or two degrees, the pulse is moderately excited, the conjunctivæ are injected, and a general sense of indisposition is felt. The Schneiderian and other portions of the mucous membrane, at first dry but injected, secrete in some hours, more or less, a thin watery fluid, often irritating in its properties, causing redness of the skin of the nostrils and upper lip. This thin serous secretion is soon replaced by a more thick or mucous material, and later still, depending upon the severity and character of the inflammation which in the severer cases is now established, the case becomes acute catarrh, and various fibrinous, corpuscular, or purulent matters are poured forth from the nostrils and other air-passages in greater or less abundance. The feverishness commonly abates as the secretion is established, the temperature is scarcely above the normal, and the skin, which at first was perhaps dry, becomes moist, and sometimes there is a free sweat; the urine which earlier may have been scanty, becomes more free and deposits a sediment; the local irritation of the mucous surfaces subsides, the symptoms all abate, and the usual state of health is restored. An ordinary cold continues from a few days to a week, or to two or even three weeks, and the symptoms will vary according to the part of the mucous membrane most affected. If mostly in the nose and frontal sinuses, "the cold is in the head;" there will probably be headache, irritation of the eyes, discharge from the nostrils, etc. If more in the throat, fauces, larynx, and trachea, there will be more cough, hoarseness, expectoration, etc. When extending to the bronchial tubes, the case becomes one of bronchitis, and is more properly described elsewhere.

Although a cold usually terminates favorably in a short time, this is by no means always the case. It may result in a chronic catarrhal condition, or, extending to the bronchi and lung tissue, the most serious consequences may follow.

Not only does a "cold" resemble other inflammations and fevers of more severe forms, but the latter are often produced by the same causes as the former, and, in many instances, time will be required to determine whether one is attacked with a "cold" or some more serious inflammatory or febrile disease. Indeed, the line of separation between the state first described and an accidental or non-specific catarrhal fever or acute coryza, described further on, is by no means clearly drawn. Even a specific influenza, produced by some peculiar zymotic cause, in its milder forms is scarcely distinguishable from a "common cold." Moreover, the phenomena of fever and inflammation greatly resemble one another in many respects, as we have already seen; and although many phenomenal differences are distinguishable in different morbid affections, the similarity of all morbid states, and indeed their resemblances to physiological conditions, are more clearly recognized than formerly, and will be still more so by the profession at large in the future.

The pathological state of the affected mucous membrane in a cold requires a few more descriptive words.

The first condition noticed is that of hyperæmia. This is soon followed and accompanied by exudations of a serous fluid from the blood, containing more or less minute particles of bioplasm, by an increased mucous secretion, and by the rapid and abortive production of epithelial cells, which constitute mucous corpuscles; these having, when recent, vital properties, seem to be undergoing changes in their outline when examined by a strong magnifying power, and have amœboid movements of a distinctly living character. These vital movements and changes are noticed not only in recent mucous corpuscles, but in colorless blood corpuscles and in pus corpuscles; and, according to Dr. Beale, in no form of bioplasm can these minute living movements and changes be better studied than in these corpuscles, all of which may be produced in the discharges from the mucous membrane in a severe cold. The mucous membrane, swollen by the hyperæmia, by serous infiltration, and by the multiplication and deposits of other elements within it, is also more or less denuded of its epithelium, and presents conditions similar to those which are more fully described in the article on bronchitis.

Treatment of Colds.—With many persons a common cold may safely and properly be left to itself without special treatment. With other persons treatment is important, and in most cases benefit may be obtained, the affection may be mitigated and its course cut short by the judicious application of remedies. Another reason for treatment is found in the fact that, in the early stage of an attack, it is sometimes impossible to say whether the symptoms presented are those of a common cold or the beginning of a more serious inflammation or fever.

The principles of treatment are similar to those which have been described as applicable to other conditions where excretions have been checked, the blood has become impure, and irregularity in the innervation and circulation have occurred. The most important indication is to bring the blood back to the surface from which it has been suppressed, to excite the perspiration which has been checked, and thus to eliminate effete matters which have been retained. A hot pediluvium, a warm bath of water, air, or steam, a warm bed and warm diluent drinks, will almost certainly procure relief, and not unfrequently will abort the cold. Diuretics as well as diaphoretics are indicated, and cathartics are not unfrequently more efficient than either in removing from the system the effete matter which soon accumulates, and thus relieving the symptoms.

It should be borne in mind that the nerves, especially the vaso-motor, have very much to do in producing the irregularities of circulation and secretion, which constitute the phenomena of these affections. Impressions upon the nervous system are often most speedy and efficient in procuring relief. The particular remedies fulfilling these indications are various.

A Dover's powder or dose of morphine, given in connection with the bath, warm drinks, etc., will often cut short an attack. Better still will be a full dose—six to ten grains—of quinine, often best with an opiate, repeated a few times, so as to bring the system under its full influence. Probably the salicylate of soda will produce a similar effect.

Tincture of aconite, in moderate but repeated doses, will often operate efficiently, inducing perspiration and abating feverishness. The chlorate of potash has become one of the most popular remedies for a cold. It is generally innocent when not given in excessive doses, and is often efficient. According to Dr. Ringer, iodide of potassium, in a ten-grain dose at bedtime, at the onset, will often cut short an acute cold in the head. Various applications directly to the membrane have been advised. The inhalation of the fumes of iodine, of spirits of camphor, of pulverized bayberry bark, etc., are sometimes attended with some degree of relief.

Various compound mixtures for colds may be found in the books, operating upon some of the principles indicated. A pill, recommended by Dr. Lincoln, of New York, composed of half a grain of sulp. quinine, half a grain of camphor, and one-fourth of a grain of ext. of belladonna, taken once in two hours, for a few times, is thought, from its combination of ingredients, to have a peculiar power in arresting a cold. It often checks the irritation and secretion from the affected membrane, without producing any considerable unpleasant effects, and is worthy of trial in the cases where treatment is called for. As many of the indications presented in simple colds, and the particular medicines fulfilling them, will come under review in treating of acute coryza, simple fevers, bronchitis, etc., the articles upon these subjects are referred to.

In concluding the account of some of the milder ailments for which the physician's advice is sought, it seems proper to repeat, that by giving attention to slight deviations from normal conditions, and cutting them short as soon as possible, the more grave affections may often be prevented; and that active treatment in the earliest stages of severe diseases will often be efficient in mitigating or arresting them, when if action be delayed to a later period all remedies might fail. Even in those diseases produced by specific poisons, and which are thought to necessarily run a specific course, it is possible that early treatment may prevent the full effect of those poisons, and we should not relinquish the hope that means may yet be discovered for arresting their progress. All credit is due to those who are seeking to discover the causes of disease and methods for prevention; but those also are entitled to credit who, while diseases continue to occur, seek for means, timely applied, to cut them short. The time, it may be hoped, has passed, if it were ever present, when it is considered the highest function of the physician to study the natural history of the diseases with which he meets, to verify previous predictions in the dead-house, or, as it has been termed, "indulge in meditations upon death."

SYMPTOMATIC FEVERS.

Symptomatic Irritative Fever.—When a local or more general irritation exists, a super-excitation with change of function, but without material change of structure, recognizable as a morbid state, but not amounting to an inflammation, the feverish condition which is likely to accompany it is called a *Symptomatic Irritative Fever*. Such a fever often shades off into a simple idiopathic fever, the line of demarkation between the two conditions not being distinctly drawn. But when the irritating cause produces no local or general effect distinguishable from the phenomena of fever, it is said to be idiopathic; and when a morbid state of irritation is distinguishable from the febrile symptoms, the fever is said to be symptomatic. The phenomena of such a fever are such as belong to fevers in general, which have already been described; and its severity and continuance will depend upon the amount and permanency of the irritation and the susceptibility of the patient. Usually, although the temperature may be decidedly elevated, the fever is comparatively mild, and it readily passes away with the removal of the irritation. Among the most frequent causes of such fever are the irritation of the gastro-intestinal membrane from improper quality or quantity of food, and the reflex irritation of teething. This irritative fever shades off also into inflammatory fever, as irritation so frequently results in inflammation. The general symptoms in any of these cases will be varied, not only by the amount of irritation and susceptibility of the patient, but by the particular organs irritated, and the mingling of the local symptoms of such irritation with the general febrile phenomena.

It is unnecessary in this connection to describe the varieties of special cases that may occur.

Treatment.—The principles of *treatment* in these cases are simple, and will readily suggest themselves. The irritation and its causes will require the first and principal attention. Such irritation must be removed; and the means applicable will be pointed out by the particular irritation and its cause, which requires to be carefully inquired into. Aside from this, the fever symptoms will require, if anything is needed for the purpose, management similar to that which will be described under the head of non-specific simple fever. It is proper, however, to say here, that when the cause of irritation is removed, while the fever still continues, or in cases where the cause cannot be reached, soothing, anodyne, and neurotic remedies are often promptly and decidedly useful. By diminishing irritability, or impressibility, they diminish irritation and its results—the feverish phenomena. A properly selected opiate is most likely to procure relief. When preceded or followed by a laxative, and combined with a diaphoretic, not only the irritation, but the effete accumulations in the system, resulting from the fever, will be likely to be removed. In all cases, a regulated, bland, and moderate, or, for a day or so, a suspended diet; and rest, as a rule in bed, will be proper.

Inflammatory fever has already been referred to in the account of the general inflammatory process, and its further consideration will be postponed until special inflammatory diseases are described.

Pyæmic and septicæmic fevers are generally surgical. Some of their phenomena have been referred to, and they will receive further attention when treating of those medical diseases, or affections of internal organs in which they are likely to occur.

The subjects of pyæmia, septicæmia, embolism, and other forms of blood-poisoning and their results, and the relations of bacteria to these processes, are matters of great interest and importance, and are undergoing investigations.

The treatment of these conditions when developed is unsatisfactory, and preventive measures become doubly important. As morbid germs are now regarded as the fruitful source of these conditions, and as they multiply and abound in filth and decomposing matter, the great preventive remedy is *cleanliness*, in the largest sense of the term. Hospitalism is a term given to the conditions produced by the crowding together of large numbers of sick and wounded persons, and especially of puerperal women. When many wounded are brought together, a "traumatic atmosphere" is produced—that is, one abounding in organic matter, and in which germs—bacteria—are supposed to be abundantly present.

Scrupulous cleanliness, free ventilation, a large air space for each, and antiseptics are demanded. The antiseptic dressings of Lister—the performance of operations under a spray of carbolic acid, etc.—are not only attracting a wide-spread attention, but at present an almost equally wide-spread approval by the profession. Very recently, however, the utility, and even propriety, of the spray has been questioned, and there is little doubt that injurious effects have sometimes resulted from its use. Other means of destroying or excluding external morbid germs may be found more efficient and less objectionable than this, but the germ theory of Septicism seems at present too well established to be set aside.

The treatment usually pursued in these fevers, when established, consists in the administration of sulphites, quinine, salicylic acid, tincture of iron, carbolic acid, opiates, and good nourishment. Alcohol is often given, but its value, even after so long an experience, is not yet fully ascertained.

Catarrhal Fever, a somewhat peculiar form of irritative or inflammatory fever, will be treated of in connection with inflammation of the mucous membrane of the air-passages, coryza, etc.

IDIOPATHIC FEVERS.

All those morbid processes constituting the distinct idiopathic fevers belong particularly to medicine—to the physician as distinguished from the surgeon or the accoucheur and gynæcologist.

From their wide-spread prevalence and the large number affected, from their attacking by preference those in early and middle life, from their occurring in persons constitutionally vigorous and healthy, as well as in the feeble and diseased, from their being such common outlets of the most valuable human life, and from the many important and interesting questions connected with their causes, their phenomena, their prevention, and their treatment, they require, in a work on the Practice of Medicine, and by every medical student and practitioner, the most careful and thorough consideration.

ACCIDENTAL OR SIMPLE FEVERS.

The *Non-specific Fevers,* though they are never epidemic, and are less severe and persistent affections, are still quite frequent, especially in children and females, and in all impressible persons, and require a share of attention.

They present the phenomena common to all fevers, are ushered in by feelings of general indisposition, languor, and commonly with headache and other pains, and the usual rigors. The chill, when present, is variable in amount and continuance; the essential increased temperature occurs, often coming up rapidly to a decided fever point, from 104° to 106°. At other times the heat is less, but is still from 1° to 3° above the normal; and the common restlessness, febrile sensations, deficient or perverted secretions, increased destructive metamorphosis of tissues, and accumulation of effete matters, with subsequent increased elimination by the kidneys, bowels, and skin, are all present. The kidneys, particularly, eliminate a free quantity of urea, uric acid, and urates, the salts often being deposited on the cooling of the urine, constituting what is called the lateritious sediment. They are derived from the rapid waste of the nitrogenous elements of the tissues.

The accession of these fevers is generally abrupt, and, though more or less fluctuating in their course, with the usual variation of morning and evening temperature, the type is continuous, or but moderately remitting, until the final subsidence, which generally occurs in a few days, and sometimes in a few hours. The subsidence or defervescence, if by crisis, is usually accompanied by a freer perspiration; and the very rapid loss of heat from the surface, caused by the more ready evaporation at this still high temperature, soon brings it down to the normal standard, and sometimes even below it. When a free discharge occurs from the bowels and kidneys, not only the fever but its effects are generally speedily removed.

When these fevers are of short continuance, they are called ephemeral; when mild, as well as brief, they are called febricula. From their dependence upon accidental causes, such as exposure, moisture, and extremes of temperature, excesses, improper ingesta, suppression of secretions, shocks to the nervous system, etc., I have applied the term accidental fevers. From their approaching in character, and merging into symptomatic fevers from well-marked irritations, they are frequently designated as "irritative" fevers.

The term accidental, however, seems more appropriate, as indicating the non-specific character of the causes, and as embracing the whole class.

These simple fevers are to be distinguished from those that are specific by their sporadic occurrence, their being traced to these accidental causes, by their less persistence, and by the absence of the peculiarities belonging to each form of the specific fevers. They are to be diagnosticated from the symptomatic fevers by the absence of local or clearly distinguishable pathological conditions, aside from the phenomena of the fever, to which the pyrexial condition can be attributed. Local irritations, congestions, or inflammations may supervene in the course of a fever of this kind, thus changing the type; but the fever, if idiopathic, did not originate in, and, while continuing so, does not depend upon, the local pathological state.

The prognosis is favorable, not only as to ultimate, but, under proper treatment, as to speedy and complete recovery; yet in delicate and feeble persons a fatal result may follow. The fever is sometimes of a very active type, and, in children particularly, convulsions and coma, and rarely death, may supervene.

TREATMENT.

In all fevers there are certain general indications of treatment, which it will be well here to mention.

1. To remove the cause or prevent its effects; to neutralize or remove any poison or injurious material from the system, if any such be present.

2. To promote the elimination of effete matters, which the fever, by the more rapid destruction of tissues, produces in more than the normal quantity.

3. To reduce the temperature when excessive, to moderate the heart's action when violent, and thus diminish destructive and lowering changes and conserve the heart's power.

4. To maintain nutrition of the tissues and sustain the action of the heart and other organs when they flag, taking care, while administering food and stimulants for that purpose, to select such food and

administer it in such quantities only as the system can appropriate, and to select such stimulants as will increase action without producing irritation or congestion, or too much increase the work of the already overtasked glandular organs to eliminate them.

5. To relieve distressing symptoms and procure quiet and rest.
6. To prevent or relieve local complications.
7. To obviate the tendency to death.

At present we are limited in our knowledge of means for fulfilling the first indication—that of destroying the poisons which are the causes of so large a portion of fevers; and frequently the other morbid impressions which cause fevers are not in operation, or are not to be reached, when treatment is called for. This causative indication, however, should always be kept in mind, and a principal aim of the profession should be to learn how to fulfill it. In some cases this indication can be fulfilled; quinine seems to antidote the malarial poison; and when pent-up pus, irritating substances in the alimentary canal, obstruction of the bowels, common (not specific) poisons introduced into the system, arrested secretions, etc., are the causes of fever, their removal may often be effected. But an account of the means of fulfilling these different indications, and the methods of applying them, will constitute the practical part of what is to be said respecting the various fevers to be discussed. The very important part of the management of fevers, or, more correctly speaking, of *patients* suffering from fevers, aside from the administration of medicines, is to be conducted in the same general way in all forms of fever and in most cases of acute and severe diseases, and may appropriately be considered here.

NON-MEDICINAL MANAGEMENT OF FEVERS.

In the first place, the physician, when he can exercise a choice, should select a proper room for his fever patient. It should be of good size, with a high ceiling, kept at a proper temperature, governed somewhat by the sensations of the patient, but usually between 55° and 65° F. The mode of heating is by no means unimportant, and that is best which secures the most frequent change of air and the most steady and manageable temperature. Proper ventilation is of primary importance, and where artificial heating is required it should be so conducted as to promote that object. The best methods of heating are by open fireplaces or grates, and by indirect radiation or the introduction into the room of warmed air, which is allowed again to flow out, thus effecting a frequent change; and this may be combined with direct radiation.

When the heating is entirely from the warmed air, the temperature is apt to be kept at too high a point; and heating solely from steam and hot water radiators in the room produces no change of air. On the whole, a combination of direct and indirect radiation is best for the sick-room. The incoming current should be through or near the floor, and not too near the bed; and the outflowing current should be both at the base and near the ceiling. Some of the materials exhaled from the lungs and the surface of the body, all of which it is desirable to have removed as soon as they accumulate, rise toward the ceiling, and others sink toward the floor; while others still, on the principle of the diffusion of gases, are nearly equally distributed in all parts of the air of the room. A speedy and constant change of all the air in the apartment is desirable, as it all contains material which when taken into the lungs again and again, may do serious harm both to the patient and the attendants. Most of these materials, when discharged into the open, pure, and moving air, are soon oxidized and destroyed.

To prevent more perfectly their retention, there should be as little furniture as possible, especially of textile fabrics, in which these substances may find a lodgment. There should be no carpets and no rugs, or only such as can be readily and frequently changed and exposed to the open air. The room should be rather light, though in certain complications of inflammation of the brain or eyes, it may require darkening; and its color should be cheerful. An air or water bed, or a hair mattress, should be selected. A feather bed is objectionable, as by its surrounding the body and its non-conducting quality too much heat is retained in the parts next the bed, and, moreover, the feather bed retains more of the emanations from the patient. A mattress is most common, and if properly constructed, light and elastic, and especially if placed upon a wire mattress, and changed daily (this can be done by having two, the one not in use being exposed to the sunlight and open air), every necessary condition in this respect will be fulfilled. A water-proof material—rubber or oilcloth—should be placed over the mattress and under the sheet; and the linen of the bed and the patient should be daily changed. It may not be necessary that every article should thus frequently be sent to the laundry, but the change should be made, and the articles, when not in use, should be exposed to the open air, and, if possible, to the sun. Scrupulous cleanliness in every respect must be observed—cleanliness of the room, the person, the bed, and the air. To that end great care must be taken of the excretions, especially in the infectious fevers; as, in typhoid particularly, it is believed the infecting germs abound in the alvine discharges. They should be received into a vessel containing some disinfecting agent, such as a solution of chloride of zinc, carbolic acid, permanganate of potash, etc., or, if these are not available, into a vessel containing dry earth, and should immediately be covered with it; and in all cases, especially if these disinfecting measures are not used, the vessel containing these discharges must be immediately covered and at once removed from the room; and the contents should be buried in a trench of as dry earth as possible, and at a distance from wells or any water supply. It is absolutely essential that infectious fever discharges should not be thrown into the vaults of the ordinary country or village privy, and scarcely less important that when not thoroughly disinfected, they should not be thrown into the water-closet, however well trapped, to be sent abroad on their possible mission of death. The physician who will allow the discharges of a typhoid-fever patient, for instance, to be thrown not disinfected into the vault of a common privy to which other persons resort, must, in the present state of enlightened professional opinion, be regarded as culpable. If such privy is near a well, supplying potable water, with a moist and porous intervening soil, he must be doubly so. Caution on this subject, with reference to the spread of the disease, cannot be too explicitly expressed, nor its neglect too forcibly denounced. Indeed, the whole abominable system of privy vaults, with their fecal accumulations pent up, fermenting and decomposing, often percolating through the earth into wells, and constantly sending emanations into the air, should be abolished altogether as filthy, indecent, and a dangerous nuisance. Various substitutes have been proposed. That known as the "dry earth system" is the most practicable for a country and village population, where a good system of sewerage is impossible. It has indeed marked advantages over the sewer, when carefully and properly carried out.

Bathing and sponging the surface of the patient for purposes of cleanliness and comfort will be required in all cases, and, as a rule, should be frequently practiced, though with proper discrimination. The therapeutic uses of the bath will be noticed in describing the treatment of particular fevers.

Many persons must not be allowed in the sick-room, nor a succession of visitors. Wherever the custom prevails of neighbors and friends expressing their interest and sympathy, or gratifying their curiosity, by crowding into a fever-stricken patient's sick-room, the physician's authority must be interposed, and not only in the interest of the patient, but of the friends, the practice should be broken up—at least the visits in the individual case must be prohibited. Loud talking and mysterious whispering, of which the patient is conscious, must be alike avoided. The whispering often excites suspicion, and sometimes alarm. The rustling of dresses often annoys a patient, and every source of annoyance should be carefully avoided. There should be only so much attendance as is useful to the patient, and all fussy intermeddling, from however kind motives, should be prohibited.

The importance of a proper nurse can scarcely be overestimated. It is a matter of congratulation that the science and art of nursing is receiving so much attention, and that so many intelligent and benevolent persons are willing to devote themselves to this work. It is to be hoped that the reign of the Gamps is passing away.

A good nurse is intelligent, instructed in the duties of the art; obedient to the directions of the physician, who is the responsible autocrat in the case; honest in reporting what has actually occurred, even her own mistakes or negligence; strong, to do what is necessary in helping the movements of the patient; kind and sympathetic, but cheerful, not gloomy or effusive; vigilant, observing, and, if possible, anticipating every want, yet not fussy and obtrusive; she is gentle and quiet, but steady and firm. When all these virtues are combined in an individual, as they sometimes are, the services of such a person are invaluable, and, where the ability exists on the part of the patient, should receive a liberal acknowledgment. When they are bestowed upon the poor, a reward will come from other sources. In ordinary, and particularly in country practice, professional nurses cannot often be obtained; then the best attendant possible should be selected, and should be carefully, and often repeatedly, instructed in the details of necessary services.

The matter of food and feeding is of very great importance, and often of difficulty, requiring much judgment and skill. The famous epitaph of Dr. Graves, "He fed fevers," has done much good, but it may also have done harm, as it has been abused. The extremes of stuffing and starving should alike be avoided. While in protracted cases the importance of keeping up the nutrition can scarcely be exaggerated, in short attacks and in the early stages, and generally for the first day or two, very little and sometimes no food will be required. The gastric secretion and the powers of digestion and appropriation are more or less limited in all cases of severe fever; and it never should be forgotten that more food taken into the stomach than can be digested and absorbed will prove a source of irritation and harm; and more absorbed into the blood than can be used by the system, imposes an additional task upon the laboring organs to dispose of the redundancy. The physician must judge in each individual case as to what is required and can be borne, and specific directions must be explicitly given. In hospital practice, particular bills of dietaries are prearranged, and the trained nurses may be briefly told to use a certain formula. In private practice, all the details of preparation and administration must be seen to, and must not be left to the judgment or the whims of an ignorant or inexperienced attendant. Even professional nurses often have crude and erroneous notions, and the matter is too important to be left to any chance or uncertainty.

Milk, on the whole, is the most important staple. Milk with farinaceous substances, the latter very thoroughly and delicately cooked and mingled with the milk, often diluted, constituting a mixture of milk and farinaceous substances—a nice gruel—is the food best adapted to most cases. But milk, especially when taken clear, and sometimes in any form, disagrees with some persons, and cannot be relied on. When diluted with lime-water it can sometimes be borne, when not otherwise. Beef-tea is often used, and useful when properly prepared—a matter of the utmost importance when it is depended upon; but it acts, perhaps, more as a stimulant than a food, as it contains but a moderate quantity of solid and substantial nutrient matters. There is far more nutrient material in the same quantity of milk, or milk and farinaceous gruel, than even in the best prepared beef-tea; and this should be borne in mind where nutrient substances in considerable quantity are demanded. In some cases solid food can be digested and will be best. The tenderest muscle of beef or mutton, bruised and scraped into a disintegrated mass, a small portion in a rounded ball put upon a hot gridiron for a very short time to give a flavor of being cooked, but leaving the greater part quite raw—this, properly seasoned, will often be taken, even with some relish, when liquid foods are less acceptable; and this raw flesh is capable of affording much more nutrition than slops. The addition of hydrochloric acid or pepsin to animal food, either before or after its introduction into the stomach, often aids markedly the digestive process, leaving the stomach with little more to do than to absorb the digested substances. The art of cooking for the sick, and indeed for the well, requires the attention of the physician.

It is important, always, that the evacuations should be inquired after, and that a full account of them should be given. It is not sufficient to be informed by the nurse that a very sick patient has "passed water." Even where small quantities of urine have been passed, frequently the bladder may be largely distended, or, from its long detention, the urine may be undergoing decomposition and producing severe irritation and ammoniacal absorption. The hand should be passed over the region of the lower abdomen at each visit, to ascertain whether such distention is present; and, in all cases of doubt, a well-cleansed catheter should be used. Great mischief, even fatal consequences, not very unfrequently arise from this neglect.

The danger of bed-sores, in protracted cases, should be borne in mind and guarded against. They are to be prevented by the utmost cleanliness and smoothness of the bed and linen, particularly avoiding the discharge or spilling of urine in the bed, and its consequent decomposition and production of ammonia there. Change of position, from lying on the back to the sides, and even to the anterior aspect of the body, is often important; thus, and by other means, taking the pressure from the threatened part. The tendency is to be further obviated by keeping up the nutrition, by frequently bathing the exposed parts, and by abating the great heat of fever which disposes to destructive changes.

Patients often require moving, and may, with decided advantage, be transferred from one couch to another while changes of linen take place. A frame of the size of the mattress, to which an impervious cloth may be attached, would enable the patient to be taken up by two persons and carried across the room, or into an adjoining apartment, without disturbance or exertion; or, in the absence of such arrangement, two light poles, the length of the person, may be rolled up in the under sheet from each margin until coming near the body, when a person on each side, firmly grasping the sheet and poles near the ends, can carry the patient about with a similar freedom from disturbance and fatigue. A very weak person should not be allowed to assume the erect position, as fainting, or even permanent failure of the heart's action, may result.

The physician should give all directions clearly, often repeatedly, and not unfrequently in writing. An attendant, in the agitation of anxiety or embarrassment, often fails to comprehend the directions, or forgets them almost as soon as given, and great explicitness, therefore, is often required; and the physician should take pains to see at each visit that his directions have been understood and complied with. This is to be ascertained, not by asking in a general way whether the directions have been followed; but by asking particularly what has been done—when, and how much, food and medicine have been given, etc.

The physician should cultivate a proper manner in the sick-room; and, what is vastly more important, as leading to that proper manner, he should have proper sentiments and feelings with regard to the high character of his profession, and his responsible and interesting relations to his patients. He should be, and then he will naturally appear to be, interested in his patient's welfare, and he must be kind and sympathetic. While allowing all proper liberty, he should be firm in essentials; and by his intelligence, his interest, and his authority, by a proper combination of frankness and reticence, by caution and truthfulness, he should secure the respect and confidence of those under his care.

It is not given to all to reach the highest perfection in any department of human activity and usefulness, and we must be content with what is attainable. But there is an excellence in the profession of medicine of a higher order than that which depends upon scientific knowledge or the possession of the technical art, one which is shown in the practical duties of the calling, giving them the charm of a superior beauty and the merit of greater efficiency. It manifests itself not merely by the skillful use of material agents, but by a general force and manner, which give evidence of sympathy and mental energy, that inspires a confidence and exercises a control which becomes a benefit. It is difficult to speak intelligibly of this; nor is it necessary. This peculiar quality does not come by teaching; it has a higher origin. It may be better appreciated by suggesting it to the attention, and it may be more nearly reached by the possession of its ideal; it is not improved by discussion, and is not inspired by exhortation; but, according to the degree in which it is present, it places its possessor upon a higher level.

We have been delayed, but it is hoped not unprofitably, by these general directions for the hygienic management of fever patients, in our account of the treatment of these accidental fevers, which embraces the treatment of the simple febrile condition.

In the management of a case of these milder forms of fever the *causal indication* must be observed. Often the causes are temporary, and the effects spontaneously cease. In such cases it is not easy to determine the precise value of therapeutical agents, and here inefficient, or even worse than useless, measures obtain their reputation for success. In some cases, if the patient remains indoors and quiet, if he takes to his bed and abstains from food, perhaps absolutely, if previously fully or over nourished, or if otherwise he takes but little, and that of a bland character, taking water freely as his thirst demands, all is done that may be required. A judicious physician here, as in all cases, should be early called, but this ought not necessarily to imply the administration of drugs. If some temporary cause can be satisfactorily traced, and a clear diagnosis and a favorable probable prognosis can be formed, "good advice and little medicine" will suffice. But it is often difficult in the beginning of a feverish attack to determine its cause, and what will be its outcome. There are various courses of more positive treatment which will do no harm, which the essential conditions of fever suggest, and which may be of decided advantage in procuring a more speedy, a more certain, and a more complete recovery. In these cases, however mild, and arising from whatever causes, but resulting in the essential feverish action, retrograde metamorphosis is increased, effete matters are in greater abundance in the system, some of the secretions are diminished, they are seldom or never increased in proportion to the increase of effete matter requiring elimination, and in all such cases a moderate increase of action induced in the bowels, the skin, and the kidneys, by cathartics, diaphoretics, or diuretics, one or more, can scarcely fail to do good. It will be quite safe, and generally useful, in cases where no organic disease is present, and where the cause of the symptoms and their continuance are only conjectural, to order the patient to bed, to give him warm diluent drinks, and some simple diaphoretic mixture, such as the acetate of ammonia, with the addition of a moderate quantity of the syrup or the wine of ipecacuanha, to give a warm bath or at least a pediluvium, and to repeat the diaphoretic doses until sweating is induced. If after this the fever has not disappeared, a gentle saline cathartic, such as a dose of citrate of magnesia or Rochelle salts, or quite as well, perhaps better, as acting more upon the secretion of the liver, a dose of sulphate of soda. If the fever still continues, a persistence in an eliminative course, adding saline diuretics, such as acetate of potash, or other salts of potash or soda, will be useful. A light but appropriate diet, milk and farinaceous gruels, etc., will be required after the first twenty-four hours; and if the fever be free from any specific character, and the cause is no longer in operation, in a few days convalescence will almost certainly be established.

If the fever arises from *repletion*—too abundant alimentation, plethora, or the injudicious use of tonics—not only an eliminative but a depleting course may be required. Abstinence, or a lower diet and for a longer time, may be necessary, more decided purgation may be required, the use of cardiac and arterial sedatives, if the excitement of the heart and arteries is high, such as aconite, veratrum viride, salines, etc., may be needful; and if plethora be decided, and serious congestions or inflammations, or cerebral hemorrhages are threatened before the quantity of blood can be reduced by purgatives, by a low diet and the salines, a bleeding is indicated and cannot fail to be useful. The dictum entirely proscribing the use of the lancet because in former times it was used excessively, is as unphilosophical and unreasonable as it is injurious. Though it may be and is but seldom required, there are conditions which clearly indicate its use, when it would be wrong to withhold it.

If the fever has arisen from "taking cold," from a sudden lowering of the temperature by the exposure of the whole or a part of the body when there was a free quantity of blood in the heat-losing outer plane, and the reaction has occurred too late to meet the emergency, and if there is checked perspiration and effete matters have been retained, decided diaphoretics will be required. Besides eliminating from the skin the effete matters retained by suppression of its secretion, they cause a rapid loss of heat by evaporation from the surface. At the same time many of them diminish heat production by their sedative action, and thus by a double action reduce the temperature while removing the cause of the fever. Some agents reduce fever more by causing loss of heat, others by diminishing its production, while others operate in nearly equal degrees by both methods.

The loss of blood usually diminishes heat production, and yet the temperature, where there is still rapid waste, is sometimes very high in anæmic states; so that bleeding is by no means always, or even perhaps ever, indicated for increase of temperature alone; but if great increase of heat is accompanied with high cardiac excitement, and with a plethoric condition, and if severe congestion exists, a bleeding will relieve all these conditions, and may avert a hemorrhage, a serous effusion, or an inflammation that would otherwise occur and be serious. Indeed, when these latter conditions present themselves, when the plethora, congestions, effusions, hemorrhages, or inflammations are present or imminent, the bleeding may be indicated, though the temperature is not high and the circulation is oppressed and sluggish. The pulse may become fuller and the circulation freer after bleeding, and the feeling of strength and the general sensations be wonderfully improved. The quantity of blood to be taken will depend upon the size of the patient, the extent of the plethora, and the severity of the congestive state, and also upon the effect produced. On this subject of watching the effect on the pulse, the respiration, the appearance and sensations of the patient, many of the writers of half a century and more ago were very full and explicit. But since bleeding has become so nearly a "lost art" among the practitioners and writers of the present day, scarcely any directions of this kind are found in later works.

The acids, mineral and organic, are supposed to diminish feverish heat, and, to a limited extent, they probably have that effect. Dr. Fothergill recommends the following for fulfilling the indication of abating heat:

℞	Hydrochloric Acid, dilute..........	♏xv
	Syrup of Orange..................	ʒj
	Water..........................	℥ij
	M.	

To be taken at a draught every three or four hours. Lemonade and other vegetable acid drinks are often very grateful to a feverish patient, and may be advised.

Fever from suppressed secretions, of whatever kind, should be treated by eliminatives, and, when severe, by decided apyretics also.

If there be suppression of intestinal secretion and constipation, cathartics are very clearly indicated, and, as a rule, the salines are most eliminative of those that are mild in their operation, and they are not likely to produce irritation. If the secretion of the liver be deficient, and the organ congested, as indicated by a feeling of weight in its region, a bitter taste in the mouth, sleepiness and dull headache, a yellow conjunctiva, etc., cholagogues and cathartics, or cholagogue-cathartics are indicated, and are often strikingly useful.

This brings up the question as to what are cholagogues, and the articles to be selected in fever due to suppressed biliary secretion, and other deranged liver functions. It should be premised that the relation of the liver and alimentary canal, the mucous membrane of the stomach and intestines and their secretions, are so intimate that it is often impossible to determine in a given case whether the primary and principal disturbance is in the liver or in the alimentary membrane ; and the good effects of a medicine attributed to its action as a cholagogue, may be due to its action on the stomach and bowels. The question of cholagogues will be more fully considered in connection with diseases, functional and organic, of the liver. Here it is proposed more particularly to mention those remedies which procure most relief in cases of accidental fever apparently dependent on deranged and diminished secretion of the liver, accompanied, as this condition is, with disturbed function of the *prima via.*

Of these remedies I have no hesitation, in the present state of our knowledge, in giving the first place to the preparations of mercury. This remedy is to be accompanied, or better, generally, to be followed in a few hours by a cathartic, as one of the salines. For this purpose the "gray powder," as it is commonly called in England—hydrarg. cum creta—is a favorite, and is often combined with rhubarb. I prefer the *blue mass,* either in powder or pill, in doses of from two to six or more grains, often giving at the same time ten to thirty grains of bicarbonate of soda, and sometimes repeating this dose in two or four hours. But generally a single dose, followed in from two to six hours by the saline cathartic—citrate of magnesia, or Rochelle salts, in form of Seidlitz powder, or alone, will be all that is required. Lately, since the experiments of Dr. Rutherford, of Edinburgh, tending to show the superiority of sulphate of soda as a cholagogue, I have often used that salt in place of the others. It has the disadvantage of being more unpleasant to the taste than the other articles named, but the advantage of being cheaper. I have been pleased with its effects, not only in the feverish conditions under consideration, but in more chronic cases of deranged liver and stomach requiring cholagogue and eliminative remedies. The mercurial given in the moderate doses mentioned, and followed by the saline laxative or cathartic, almost never produces any of the unpleasant effects of the larger or more continued doses of the metal; and its beneficial effects seem to me unmistakable. There are many cases where I should feel that I had not done my duty to the patient should a mercurial not be directed. There are various other articles recommended as fulfilling the same indication, of acting upon the liver as cholagogues, particularly the vegetable—active principibles brought to the attention of the profession by the so-called eclectic practitioners, from whom we should accept, as from every source, anything valuable. The article of this class most generally used is the podophyllin; but in free doses this irritates too much the intestinal membrane; though in small doses thoroughly triturated with sugar of milk its effects are more mild and apparently beneficial. Euonymin and irisin are alleged to act decidedly in increasing the secretion of bile, the euonymin without irritating the intestinal membrane, while the irisin produces some effect of that kind. Most of the cathartics, as aloes, colocynth, jalap, and phosphate of soda, as well as ipecacuanha, sanguinarin, benzoate, and salicylate of soda, are reported by Dr. Rutherford to act decidedly as exciters of the secretion of the liver in the dog, and presumably in man, and clinical observations confirm some of these conclusions.

These and still other new articles may be used as cholagognes, and further experience will doubtless show more clearly their comparative value; and some of them may prove to be better than those in more common use in the past. But it does not yet appear that any of them are as efficient in modifying favorably various gastric, intestinal, and liver derangements, connected with different feverish conditions, as the mercurials.

Other eliminatives than cathartics and cholagogues will be useful, especially when the secretion of the kidneys is not sufficiently active to carry away the nitrogenous débris. The following, recommended by Dr. Fothergill, is doubtless efficient in increasing the secretions both of the kidneys and skin:

℞ Iodide of Potassium.................grs. vi
Liquor of the Acetate of Ammonia ... ℥j
M.

To be taken, properly diluted, once in four or six hours, or in smaller doses more frequently repeated. The liquor acet. ammonia alone in doses of from three to eight drachms, once in two to four or five hours, will operate both as a diaphoretic and diuretic, and its effects as an eliminative and antipyretic would often be increased beneficially by the addition of ipecacuanha in doses sufficient to produce slight nausea. An excellent cooling and eliminative drink may be prepared as follows:

℞ Bitartrate of Potash.................. ʒj
Bicarbonate of Soda.................. ℈j
M.

One half added to half a tumbler of water, and taken at one draught in a state of moderate effervescence, once in from one to three or four hours. The materials for this drink are to be found in most households, and it has the additional advantage of not being disagreeable, often even grateful, to the taste.

The diaphoretic effect of any of these agents will be increased by the warm bath; or, as a substitute, by six or eight soda-water bottles, and as many woolen stockings, filling the bottles with hot water, drawing a wet stocking over each, and surrounding the patient with them in bed. Free perspiration, with the relief it is quite sure to bring, can usually be obtained in this way in twenty or thirty minutes.

In a fever produced by a direct impression on the nervous system, with decided irritability of that system, anodynes and narcotics are particularly indicated. From ten to twenty grains of Dover's powder, or from one sixth to one quarter of a grain of a salt of morphia, with a grain, more or less, of ipecac., or a dose of chloral hydrate, or some other soothing neurotic may be sufficient to allay the symptoms. Other means may be combined or may follow, as the conditions indicate. Recently, the Jamaica Dogwood (*Piscidia erythrina*) has been recommended as an anodyne and diaphoretic, and as a substitute for opium, especially where the latter article disagrees, or is followed by unpleasant secondary effects. The fluid extract is the form in which it is commonly used; and in doses of from half a drachm to a drachm, repeated as may be required, its effects are often very agreeable, without that secondary nausea and depression sometimes following an opiate. It is, however, a powerful narcotic in large doses, and must be used with proper caution.

But accidental fevers, especially when induced by taking cold, are apt to be followed by inflammations and congestions, rendering the case much more serious than where the feverish symptoms alone appear. According to Dr. L. Beale the bioplasts increase in size, and there is an increased growth of germinal matter in all *inflammations* and *fevers*, showing their strong analogies. As fever accompanies inflammation, so inflammations tend to occur in fevers; and in severe accidental fevers local complications are to be anticipated: and more decided measures than a selection from those already more particularly described may be required.

In the foregoing remarks, an effort has been made to point out a variety of remedies, some of which may be required to mitigate the conditions and more speedily terminate the milder fevers so frequently met with, especially in children, which we have been considering. In the treatment of cases in children some modifications will be required, and great care in adapting doses, particularly of the narcotic agents, to their age and susceptibility; but the same principles are applicable as in the treatment of adults, and I have not considered it necessary to describe their cases particularly. Their peculiarities, and the particular modifications of treatment adapted to them, will be found in the special works on children and their diseases.

A leading object of this work is to state physiological and pathological facts, to inculcate correct therapeutical principles, and to instruct the student and aid the practitioner in the management of cases of illness, severe or otherwise, that he will be called upon to treat. The physician in general practice is frequently called to undertake cases in the early stage of attacks, when it may be impossible to determine the course the disease is inclined to take; and, as in most diseases controllable by treatment, such treatment is far more likely to be efficient when commenced *early*, there is a demand for prompt action before the full nature of the case is determined. In the beginning of some affections it may be best to apply the simplest tentative measures, and wait for the disease to declare itself more fully before active measures are instituted. In other cases there are well-defined indications present which will justify decided treatment in reference to them, though the distinctive character of the disease in its full development may not be known.

The physician, for example, may be called to a patient, who, after exposure to cold and wet, or some other exciting cause, has had a chill, and is now in the hot stage of a severe fever. His temperature may be up to 104°, 105°, or even 105.5°, though often less, and possibly higher. There are general pains not specially concentrated in one locality; there is labored breathing, but no physical signs of structural change of the lungs; there may be nausea and vomiting, but no tenderness on pressure over the stomach or any part of the abdomen; the urine may, or may not, be scanty; but, though it may have an increased quantity of urea and uric acid, it has neither albumen, blood, nor casts, and pressure over the kidneys fails to elicit tenderness. There may be severe pain in the head, but still none of those symptoms pointing to special disease of the brain or its membranes. In short, the disease seems general, and no evidence of a local inflammation is present; and yet every practitioner, who sees many diseases in their beginning, knows that within twenty-four or forty-eight hours there is likely to be a severe local inflammation developed—it may be within the chest, the abdomen, or the cranium.

In such a case what is the physician to do? Is he to give a placebo and wait for whatever may turn up? Wait for the dullness on percussion, the crepitant râle, or the characteristic sputa of pneumonia; or for the red tongue, the burning pain, the tenderness on pressure of gastritis; or the delirium, convulsions, or coma of encephalitis before he institutes active treatment? Or, in an obscure case, is he to await the results of a *post-mortem* examination to clear up the diagnosis, through fear of acting without a full acquaintance with the nosology of the case? In the case supposed, some two or three days might elapse before characteristic symptoms of local disease declared themselves, and the opportunity might be lost of putting any decided check on the severity or continuance of the morbid state. On the other hand, mischief might be done by striking a heavy and injudicious blow in the dark, and the opportunity of making the diagnosis by an autopsy might be hastened or insured. The question as to what course should be pursued in such cases would be differently answered by different authorities, and a satisfactory answer applicable to all cases cannot be given: yet an answer to this question is what the young practitioner particularly wants. The question as to what is to be done in the case supposed will depend upon the answer to another question, viz., Have we any remedies applicable to this condition of fever—to the pyrexial state with the inflammatory nidus, to this state of morbid actions common to accidental fevers and incipient inflammations—which are capable of arresting its course with safety to all other conditions of the system, and which are likely to do so when energetically and properly applied? This question, I am sorry to think, may receive different answers from those who may be regarded as leaders of professional sentiment.

In some of the specific fevers with the inflammatory nidus, such as small-pox and scarlatina, we know of no means by which they can be arrested, and our efforts here are confined to attempts at palliation and to conducting the case through its course. Still, in the specific fevers, as in those that are accidental or inflammatory, perhaps the greatest danger is from the continued high temperature, and the abatement of the excessive heat as an important palliative measure is called for. Continued excessive body heat, whatever the cause, leads to degenerative processes and the typhoid state with all its disastrous consequences. The abatement of a high fever heat is always indicated, and it is palliative of organic suffering even where, as in specific fevers, it fails to arrest the course of the disease.

The accidental fevers and the non-specific inflammations are not so persistent as most of the specific affections. Not only is the temperature capable of being lowered, but with this, other conditions are capable of being modified and the whole disease of being arrested; and I have no hesitation in believing that the question proposed should be answered in the affirmative. Whatever opinions may be entertained by those hospital and consulting physicians who see diseases, as a rule, only in their more advanced stages, those practitioners who often see the attacks such as are under consideration in their beginning, and who combat them energetically and judiciously, will not doubt the efficacy of treatment, or hesitate as to what should be the answer to the question. Dr. Thomas K. Chambers, in an address delivered at the opening of the London School of Medicine for Women, 1879, said: "The minds of successful physicians are very various in calibre; but they possess in common certain qualities not inconsistent with this variety, which qualities are the true causes of success. All have a marked power of concentrating their attention upon the matter in hand, and seizing the point at issue." He presents various illustrations of the importance of seizing upon the more important indications, without always waiting for the settlement of all collateral questions, and says, "the successful physician will sometimes apply means to cure the condition discovered, before the conclusion of the diagnosis." The cases supposed are among these where the successful practitioner will act promptly. Not unfrequently some of the remedies already suggested will be sufficient to arrest the course of events; but there are more powerful agents, and more efficient methods of using some of those already proposed, which now claim attention.

According to our present experience, and in my judgment, our most efficient *Apyretics* are, quinine, jaborandi, opium in free doses often combined with belladonna, aconite, veratrum viride, chloral hydrate, and in some forms of fever and inflammation, at least, salicylic acid or salicylate of soda. All these articles make a strong impression on the nervous system, which is so prominent an agent in the production of morbid phenomena; and they, perhaps, also act upon the conditions of the blood, the vessels, and the tissues, modifying directly molecular action. But in whatever way their effects are produced, the result is abatement and frequently arrest of the fever and the inflammation, even after its processes have been fully inaugurated, and sometimes when they are all much advanced. The safest, and perhaps on the whole the most efficient of the articles is *quinine*. In doses of from ten to thirty grains, or smaller ones more frequently repeated, but so that at least twenty grains are present in the system at once, the apyretic and anti-inflammatory effects are unquestionable and decided, and a speedy arrest of all the morbid processes by its prompt use very often occurs. This result will be more certainly secured, at least in many cases, by the combination of an opiate, as morphine and ipecac., or a Dover's powder, with the quinine, so as to secure a decidedly soothing and a perceptible narcotic effect. As a rule, when this impression of the quinine is fully made, and the temperature is brought down to near the normal standard, and a free perspiration induced, the remedy need not be continued long, or be many times repeated. In the meantime a cathartic or other eliminative treatment, as before indicated, may be prescribed; but the quinine impression should be repeated in twenty-four, or thirty-six, or forty-eight hours, if the fever and other symptoms return. The efficacy, the comparative harmlessness, and therefore the propriety of this course cannot be too earnestly commended. As this treatment has already been recommended in the general treatment of inflammations, and as there will be frequent occasions to speak of it again in describing the treatment of particular inflammatory diseases, nothing more need here be said, notwithstanding its very great importance.

The jaborandi has wonderful power in inducing free sweating, in diminishing the action of the heart, and reducing feverish heat. It sometimes depresses the vital actions even alarmingly, and requires to be used with caution; but its depressing effects, when not carried too far, are temporary, and in the early stage of a fever in a fairly vigorous person, the full diaphoretic and apyretic effect may be produced with reasonable safety. Its active principle—pilocarpin—may be used in place of the fluid extract.

The aconite and veratrum viride operate as sedatives to the heart's action, and often reduce the temperature markedly and induce perspiration, but they are more dangerous than quinine when carried to the extent of their full apyretic action, from the amount of depression produced; and in feeble patients or advanced stages of disease are often decidedly objectionable in the doses necessary to be efficacious. There are cases, however, where their utility cannot be questioned, and they present themselves among the antipyretic agents from which selections are to be made. A drop or two of the tinct. of aconite, frequently repeated until relaxation or nausea occurs, or similar though somewhat larger doses of the tinct. or fluid ext. of ver. vir., used in a similar manner, are the methods advised.*

Chloral hydrate, in doses of from 40 to 80 grains, will usually cause a fall of temperature from 3° to 4° F., and at the same time induce sleep, and may be efficient in cutting short an accidental fever; but in free doses, alarming and even fatal effects have followed. It must therefore be used cautiously, but it can generally be prescribed for persons free from idiosyncrasies.

The efficacy of salicylic acid in rheumatic fever and inflammation is now generally acknowledged, and its application to ordinary fevers and inflammations has much testimony in its favor. It has not long been in use for apyretic purposes, and its exact value has not perhaps been determined. In the German and Swiss hospitals, it is to a large extent taking the place of quinine as an antipyretic. It is used in doses of a drachm or more, and is thought to disturb the nervous system less than the antipyretic doses of quinine.

But full medicinally narcotic doses of opium, better perhaps in the form of morphine, either alone or combined with relaxing and eliminative articles to prevent its ordinary effects of diminishing most of the secretions, will often be exceedingly efficient in not only mitigating symptoms and procuring rest, but in subduing fever and inflammation. Its combination with quinine has been spoken of, but of itself it is a powerful antipyretic and anti-inflammatory remedy. In developed inflammations, such as peritonitis, where it fails to arrest the disease, it diminishes shock, and tends to enable the patient to endure it.

Digitalis has a reputation as an antipyretic, given in repeated doses, and continued for some time. It is, however, not as prompt and certain in producing this effect as most of the other articles mentioned; but it, too, may be placed among the articles from which a choice is to be made. Niemeyer strongly recommends it, in connection with quinine, in pneumonia and other inflammatory fevers. A specimen prescription would be:

℞ Sulph. Quinine................	grs. v
Tinct. Digitalis................	♏xv
Phos. Acid, dilute.............	♏xv
M.	

To be taken properly diluted once in four or six hours.

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* To save the extension of the text with unnecessary details, the ordinary doses as recommended in works on Mat. Med. are understood unless particular quantities in reference to special agents are designated. The matter of dosage, however, the time and manner of administration, the varied and sometimes opposite effect of large and small doses, is one of great importance, and, in many cases, special directions as to doses will be required.

Various other remedies, some new and others old, have their advocates (gelseminum among the new, and tartrate of antimony and potassa among the old) as antipyretic agents; and while their usefulness in certain cases is not denied, their efficacy is not equal to those before mentioned. Antimony is liable to do harm by its spanæmic and permanently debilitating effects, and its irritation of the mucous membrane of the stomach and intestines. Various saline and neutral mixtures, as the citrate, acetate, and tartrate of potash, the acetate of ammonia and the salts of soda, produce some antipyretic effects, operating at the same time upon the secreting organs and eliminating effete matters from the system. The indications for their use have already been mentioned.

The use of cold water and the bath in simple fevers, and the febrile state generally, is receiving much attention; and experience with it is accumulating on a large scale. As a palliative in abating excessive heat, when properly and systematically applied, it is doubtless of exceeding value—patients being saved by it who would otherwise inevitably perish. A temperature as high as 107° to 110° or 112°, if continued for any length of time, whatever the cause, produces such degenerative changes in the tissues, especially in the heart, as lead to suspension of function and death. By means of the bath or of affusions the temperature can be kept down, and such consequences prevented; but the influence such treatment exerts on the continuance of fevers and inflammations, and in preventing their development when applied in the forming stages, has not been sufficiently ascertained. The use of cold water in specific fevers, and particular inflammations, will receive attention when those diseases are discussed. The free internal use of water, either plain or flavored, cold or hot, according to the taste of the patient and the stage and condition of the fever, the state of the stomach, etc., is generally useful. It aids elimination of effete matters from the kidneys, skin, and intestines, often reduces temperature, relieves the dryness of the mouth and throat, and promotes in every way the comfort of the fever patient. Although the free use of water is advisable, excess is possible, overloading and distending the stomach, and producing irritation and vomiting. When these effects are not produced the supply should generally be unlimited.

The space occupied with the pathology of the pyrexial state, and particularly that devoted to simple, non-specific fevers, may seem out of proportion to that which will be given to some of the particular and more severe diseases. But a knowledge of the general subject of fever will be the best, and, indeed, the only preparation for a more ready and full understanding of its different varieties; and many of the principles, pathological and therapeutical, concerned in non-specific fevers are applicable to other forms, and to the allied condition of inflammation as well.

This full discussion of the simple fevers, which are less severe, and in themselves of less interest than many of the specific fevers, will obviate the necessity of so lengthy an account of the latter.

Time will be saved, and a better knowledge of the particular specific fevers obtained, by a careful study of what has preceded.

SPECIFIC FEVERS.

Specific fevers have already been defined substantially as those which depend upon peculiar poisons, which present some distinctive characteristics, and which ordinarily pursue a somewhat definite course.

The present views respecting the character of the poison producing them, and some of the reasons for their entertainment, have also been given in discussing the general pathology of fevers, and additional facts and influences will be referred to in the account to be given of the special forms. Following the arrangement in our classification, the first in order are the

MALARIAL FEVERS.

The leading characteristic in the phenomena of these fevers, in a majority of cases, is a marked periodicity, and hence the name Periodical Fevers has been applied, distinguishing them from those having less of this fluctuating character, and which are called Continued Fevers.

Bristowe applies the term ague to all the varieties of malarial fevers, and defines ague as a "specific non-contagious fever produced by malaria, characterized by enlargement of the spleen and recurring attacks of fever, attended each with a cold, a hot, and a sweating stage, and having an indefinite duration, and a tendency to recur, which may last for many years or during a whole life." But some forms of malarial fever are not characterized by the three stages, well defined, as indicated; and although the spleen is more or less enlarged as a rule, yet it is enlarged almost, if not quite, as constantly in enteric or typhoid fever, if not to the same extent; and this enlargement of the spleen is not sufficiently characteristic or severe to entitle it to be placed as the leading phenomenon of the disease. Although it has a tendency to recur, and in rare cases, and where neglected, it may do so for several years when the patient is removed from the exciting cause, yet it gives too strong an impression of its persistency to say that it may last during the whole of life.

Those who have seen whole communities affected with it, who have seen them continue in the same locality, where individuals occasionally suffer from it, showing the cause in some degree to still exist, and yet have seen that same community as healthy, as vigorous, as enterprising, and as efficient as any other, come to look upon it as not so formidable and permanent an affection, when properly treated, as those knowing less about it suppose.

It is unquestionably not communicable from person to person, and is as certainly dependent upon a peculiar specific poison; and, though its duration is not as definite as in other specific fevers, it yet has a tendency to a spontaneous termination, and its recurrences generally in time lose their severity and persistency, and a good degree of acclimation, in a majority of cases, is soon acquired. Had all who had been attacked with the disease followed the advice given by authors whose observations have been in large cities, where the disease is almost unknown, and removed from the locality where they were attacked, the greater part of the Mississippi Valley and the Northwest would have been abandoned; and the great granary of the world would have been a wilderness, inhabited by wild beasts and roving savages, instead of being, as now, a great centre of enterprise and intelligence.

But a few sentences can give no adequate idea of this class of diseases, and a particular description of its different varieties is required.

Although malarial fevers all depend upon the same general cause, are constantly running into each other, and are therefore specifically the same, yet the phenomena of the different varieties are so dissimilar as to require, for the purposes of description and study, the divisions made in the table of classification, into Intermittent, Remittent, and Pernicious forms.

INTERMITTENT FEVER—AGUE.

The intermittent variety is the least severe, but most characteristic form of the disease. In its somewhat milder forms it is generally called, in the localities of its greater prevalence, the common ague. This variety is marked by four well-defined conditions during each evolution of its phenomena. There is, first, the cold stage, or *chill*, resembling the description of the cold stage of fevers in general, but usually more decided than in other forms of fever. Sometimes prodroma of general indisposition, with coated tongue, a sense of weight in the regions of the liver and spleen, and a slight jaundiced condition precede; but often the attack is sudden. In the midst of the usual state of health the face becomes pale and shrunken, the lips blue, the hands cold and shriveled, and the nails purple or lead colored at their base. An intense sense of coldness seizes the whole body, the papillæ of the skin often rising in prominences, giving the appearance of what is called "goose-flesh;" the teeth chatter, the whole body is agitated and shaking, as when plunged into cold water; the breath is short, and the voice abrupt and interrupted. The patient seeks a fire; but this gives little relief to the sensations; thirst soon occurs; sometimes pain in different organs; occasionally there are nausea and vomiting; a feeble and contracted pulse, and sometimes great prostration of all the vital functions.

This cold stage varies very much in intensity and duration, continuing sometimes only some minutes, at others, two or three hours, or even longer; but usually from three quarters of an hour to an hour and a half, when the hot stage succeeds. During the cold stage, when the temperature of the extremities is low, that of the blood, as indicated by the thermometer in the deep cavities, and often even of the trunk, is above the normal. As less heat is lost during this stage from the small quantity of blood at the surface, and from the increased covering and the application of external warmth; and as during the approach of the hot stage the increased heat production comes on with more force, the temperature rises very rapidly and obtains a great height, often 105° or 106°, and sometimes even more, and the hot stage is fully developed. The blood now comes to the surface, the face is red and expanded, the pulse becomes full and strong, the sense of heat intense, though for a time an occasional sense of creeping coldness will alternate. Pain now occurs in the head and back, and throughout the body, often very severely. There is great thirst, loss of appetite, sometimes nausea and vomiting; the mind is excited, sometimes to delirium, and the sufferings of the patient are generally very great. The secretion of urine during the cold stage is usually abundant, and is of a pale color. During the hot stage it is more variable in amount, still often free, but now high colored, and containing free quantities of urea and urates. The tongue throughout is coated more or less; during the cold stage it is often bluish, but during the hot stage it is often red and dry. In short, the patient has all the phenomena of fever of a high grade of intensity.

This hot stage is very variable in duration, sometimes continuing not more than an hour, at others, ten or twelve hours, but commonly, in what is called common ague, not more than four or five hours.

The third or sweating stage now comes on, sometimes with a free sweat and rapid subsidence of the heat, and at other times the sweat breaks out to dry up again—the increased heat-production continuing for a time. The abnormal temperature during the sweating stage entirely subsides, however; the pains disappear, and the patient, though feeling weak and languid, with an unpleasant taste in his mouth, and a disagreeable, peculiar odor of his reeking body, is, in his first experience, no less astonished than gratified at his suddenly improved condition. This sweating stage also varies in its continuance from less than an hour to two or three hours. The sweat has an acid reaction, has abundant salts and organic matter, especially fat acids, to which its odor is chiefly due. The urine is acid, has a free quantity of pigment, and generally abounds in urates and uric acid. The amount of urea is generally increased as the temperature increases, but during the sweating stage and the apyretic period it is often below the normal amount.

The fourth condition, or that of apyrexia, follows the sweating; the appetite may return, and though the feelings of vigorous health are not experienced, and the tongue remains coated, etc., the phenomena of fever disappear. This state continues until the next paroxysm, which, according to the type, may be twenty-four, forty-eight, or rarely seventy-two hours from the time of the first attack.

The term Intermitting Fever is often applied to a variety rather more severe than the form just described, or at least to one where, during the period of apyrexia, the relief of the general symptoms is not so complete, and where the cold stage is not so well marked by convulsive shakings; and, further, where the hot stage is rather more protracted. This distinction, however, is not always made, and the terms Intermitting Fever and Ague may be indiscriminately and properly applied to all the cases where a period of apyrexia occurs.

Left to itself, intermitting fever is variable and indefinite in its course and duration, but is generally protracted; and when spontaneously subsiding after long continuance, it commonly leaves the system in an anæmic and debilitated state, with enlarged spleen, congested and otherwise altered liver, frequently with moderate dropsical conditions, and general derangement of the secretions, and with a special liability to recurrence of attacks.

The other forms of malarial fever, the *remittent* and *pernicious*, are simply varieties with the intermittent of one species of periodical fever, but they differ so much in phenomena as to require a separate consideration.

In common ague, as we have seen, the stages are well marked. The chill of from a few minutes to an hour or more, is followed by a fever usually of a longer continuance, and this by a relieving sweat and a period of the absence of these phenomena. The picture of ague would, however, be very incomplete if some marked deviations from this type were not mentioned.

One of the most important in its effects, and therefore essential to be recognized, is what is popularly called "Dumb Ague," a state in which the ague cause is operating, often severely, but where the usual stages are not expressed. There are usually sensations of slight chilliness, and a moderate elevation of temperature, but no decided rigors or feverish flushing of the face, and generally there is an entire absence of the sweat. The blood-glands, the blood, and the secretions are more rapidly deteriorated and deranged than in the common cases of well-expressed ague. From the obscurity of the symptoms, these cases are sometimes not recognized, and are therefore neglected; but they require even more prompt treatment than the ordinary forms.

In other cases paroxysmal neuralgias appear without a recognized chill or fever, more frequently affecting the right brow than other parts of the body, and often not as readily yielding to treatment as most other forms of malarial disease. The blood deterioration and glandular derangements are not as marked as in the "dumb ague."

In other cases, at the time of the paroxysm, active vomiting and purging occur, at first perhaps of bile, but at length of a serous fluid, and often so profuse as to simulate the symptoms of malignant cholera—with the "washer-woman's" hands, the cold sweats, extreme thirst, ashy pale or leaden surface, the severe cramps, and sometimes collapse and death. These results, however, are much more easily averted than in Asiatic cholera. Other unusual manifestations and complications sometimes occur, and other diseases attacking those whose systems are affected with malaria, are modified by this influence, the symptoms often assuming a degree of periodicity not usual in such diseases.

The period intervening between the cessation of one paroxysm and the commencement of the next, is called the Intermission; that between the commencement of one and the commencement of the next, is called the Interval. There are different types of ague as to periodicity, and these types are determined by the length of the interval.

In some the interval is twenty-four hours or thereabout, the paroxysms occurring daily, and they are therefore called Quotidian Agues.

In others the interval is forty-eight hours, more or less, and the paroxysms occur every second day. The name "Tertian" is given to this type of ague.

When the paroxysm occurs only on each third day, as is very rarely the case in the Northwest, the term Quartan is used.

Other varieties are mentioned where the interval is still longer, but they are too rare to require notice.

There are what are called "Double Tertians," where a paroxysm occurs daily, but where those of alternate days correspond with each other in the hour of the attack and in their characters, while the immediately succeeding paroxysms do not thus correspond. There are also Anticipating and Retarding cases. In the former, usually commencing as a tertian, each paroxysm occurs earlier in the day than its predecessor; while in the latter, usually commencing as a quotidian, the attacks are later each day. In the one case the tertian may be converted into a quotidian, and in the other the quotidian into a tertian. In the anticipating variety the disease is regarded as becoming worse, in the retarding as better. Abrupt changes from the quotidian to the tertian, and from the tertian to the quotidian, also occur.

Besides these there are very rarely erratic or irregular types, observing no strict order of periodicity.

In quotidians the paroxysms more commonly occur early in the day, from eight to eleven o'clock, while in tertians they occur a few hours later, near midday, and sometimes in the afternoon. There is, however, no uniformity in this respect, and the length of the paroxysm does not depend upon the type as to the frequency of occurrence of the attacks. As already intimated, agues tend to self-limitation, but the period of spontaneous subsidence is exceedingly varied. A few paroxysms, or even a single one, may be followed by spontaneous recovery; or the disease, in varied forms, may continue for long periods. In spontaneous recoveries and returns of the disease, septenary periods are more frequently observed than others; the changes are more likely to occur on the seventh, fourteenth, and twenty-first days from the preceding change than at other times. The reason for this, as for many other periodicities, the present state of our knowledge does not enable us to give. In the neglected and protracted cases, enlargement of the spleen, sometimes to great dimensions, is very apt to occur, and a depraved and cachectic condition of an extreme character is sometimes produced. Besides the spleen; the liver, the mesenteric glands, the alimentary canal, the bronchi and lungs, and the brain, may suffer structurally, with corresponding changes of function. Blood poisoning, anæmia, tissue perversions, neuralgias, hemorrhages, or dropsy may follow. These conditions, as accompaniments or sequelæ, are apt to attend intermittent fever, though when the disease is speedily arrested the cure is often complete and permanent. The longer it is allowed to run, the more likely are relapses to occur, and the greater are the derangements of the spleen, the liver, the blood, and the general system.

The long continuance of ague, or its frequent relapses, showing that the morbid influence continues in the system, often produce very serious results. The spleen becomes enlarged, and its blood-producing functions perverted. The blood loses many of its red corpuscles, while the white increase in number, but diminish in size ; a dropsical tendency is manifested in œdema, especially of the lower extremities, and often by effusion in the peritoneum, and an anæmic appearance is marked.

The liver is enlarged and otherwise structurally and functionally changed ; a jaundiced appearance is commonly present, the urine is loaded with bile, the stools clay-colored, palpitations of the heart and venous hums appear ; epistaxis and profuse menstruations sometimes take place ; the appetite is variable, sometimes nearly lost, and at others ravenous, but the digestion is imperfect, and the malarial cachexia is developed. The change of color in the skin and other tissues is not due alone to the presence in them of bile, but also to the conversion in the spleen of hæmatine into pigment, which becomes distributed over the body. This material often obstructs minute vessels, and doubtless does much mischief, and may conduce to the production of nephritis, sclerosis, and amyloid and other degenerations of different organs, neuralgias and various nervous affections. All these results may follow from a neglected common ague, but they also follow more serious malarial diseases, and will be briefly referred to again.

Diagnosis.—In the progress of common agues, local irritations, congestions, and sometimes inflammations may complicate the cases. When inflammatory complications are present, the type of fever is changed, the intermissions are lost or become less perfect, and each paroxysm of fever aggravates the local disease. In such cases the malarial element may be obscured, but it is to be distinguished by the locality of the patient, by his having had previous attacks, by the greater periodicity of the symptoms—aggravations at particular periods of the day, especially if such aggravations appear in the forenoons—and often by the fever being out of proportion to the amount of local disease, and not so fully following its changes.

Ague is to be distinguished from Hectic Fever by the absence of chronic suppurative or other local disease ; by the more equal distribution of the feverish heat over the surface of the body ; and particularly by the relieving, instead of the depressing and uncomfortable sweat, and by its occurrence in the daytime, at least as often as in the night; also by the peculiar odor of the ague perspiration, by the exposure to the malarious influence, by the effect upon the spleen and liver, and by the general character of the symptoms and appearance of the patient.

Prognosis.—The prognosis, under proper treatment, is exceedingly favorable as to the arrest of the course of the disease; and "common ague" is seldom immediately fatal when left to itself. Some cases, however, persist in recurring, especially if permitted to continue long before interruption; and even in the common forms of the disease, alarming and even fatal results occasionally follow. Various historical persons in England and elsewhere have died of ague; and Shakespeare, who is true to facts and nature, made his Falstaff die of what Mrs. Quickly called a "quotidian tertian," indicating that ague was not an uncommon cause of death at the time represented. The remitting form of malarial fever is much more dangerous, and the pernicious variety is fatal when left to itself.

The severer forms of malarial fever, remitting and pernicious, resemble other diseases from which they should be carefully distinguished, but this hereafter.

Etiology.—The *cause* of ague is now universally considered to be some poisonous material belonging to particular localities, which has received the name of malaria, or more distinctively, marsh miasm or paludal miasm. The existence of this material has not been physically and conclusively demonstrated, but it has been satisfactorily inferred from its effects.

Signor Tommasi, of Rome, and Professor Klebs, of Prague, in the spring of 1879, made some investigations into the physical cause of marsh fever, in which they report the discovery of a microscopic fungus in the *Agro Romano,* which they alleged produced the phenomena of ague in animals to which the fungi were administered. These experimenters gave the name of *Bacillus Malariæ* to the fungus; but these observations have not been sufficiently confirmed to enable us to regard the question settled as to the form of matter constituting the malarial poison.

The particular class of diseases called malarial are found to prevail in certain localities, independent of the habits and all other conditions of the people. Persons going to these infected localities, who are not acclimated, take the disease, whether there happen to be others there affected with it or not; and proximity to, or avoidance of, the persons ill with the disease has no perceptible effect upon its occurrence. In numerous instances, persons residing at a distance of from one to a few miles from a locality where the disease originates, remain free from it while there are no winds, or when the winds blow so as to carry the air from the infected locality away from their residences; but when the wind changes so as to bring the air from the infected region to these persons, they take the disease. In other very numerous cases, persons remaining in localities free from the disease, and who have been exempt for long periods, have taken it when new soil has been broken up, or when a portion of the ground has been inundated, the water drawn off, and the earth exposed to the sun. Persons susceptible to the ague visiting in the night or early morning a particular locality, as the marshy rice-fields of South Carolina, are almost sure to take the disease; while they can visit the same place in the daytime with comparative impunity. These, and numerous other similar facts, prove conclusively that there is an influence belonging to some localities, which does not belong to others, capable of producing the disease; and the facts respecting the influence of winds, together with other corroborating evidence, show satisfactorily that the influence is connected with a material substance. The nature of that substance, in the absence of its actual detection and of positive proof of the particular kind of substance producing the effect, must be conjectural; and various conjectures have been indulged. From numerous analogies and considerations there is the strongest probability that the material is organic and vegetable, or in that border land between the vegetable and animal organisms. In what form it enters the body, whether it multiplies there, and if so, in what manner; and what changes it effects in order to produce the phenomena of the disease, are matters entirely unknown, and respecting which it is unnecessary here to speculate. Of the conditions of localities which give rise to its production, we have more knowledge, and they are worthy of being carefully inquired into.

Ague districts are found scattered here and there over all the zones of the earth except the frigid; but the poison, as a rule, is more intense and more severe in its effects the nearer the equator. The localities of its production are usually not far above the sea-level, and are low compared with their surroundings; and yet those living upon a bluff a few hundred feet above, but near, a low spot where the poison is supposed to be produced, are sometimes more seriously and more generally affected than those nearer the source and on a lower level. It seems to have a specific gravity which causes it, sometimes at least, to rise some distance above the surface, but it is not found in mountainous regions. These malaria-producing localities are usually moist and alluvial, with abundant vegetation; but sometimes the poison is produced on comparatively dry and sandy plains when the virgin soil is broken by the plow, or when deeper excavations are made. A certain amount and duration of summer heat seems necessary to its existence, and it is not produced during the frosts of winter. The season of the year when diseases from malaria most prevail in the Northwest is the latter part of summer and autumn; and they are particularly likely to occur when the first part of the warm season is wet and the latter part dry. Drying of the soil after inundation, in a malarious region, is particularly productive of the poison.

No single condition which has as yet been traced necessarily produces this substance. It certainly is not high temperature alone, for some of the hottest regions are free from it. It cannot be water and aqueous vapor, for many of the most wet and foggy places are exempt from its influence, and it prevails more in the season of drought than of rain. It cannot depend simply upon decaying vegetable matter, as that takes place, sometimes on a large scale, where ague never comes, and ague often appears where no such decay is taking place. It certainly does not depend on human excreta or contamination, or on the presence of animal matter in any form, as it is far less likely to prevail in crowded cities than in the open country. Notwithstanding this list of negations, the facts warrant certain positive conclusions respecting the conditions of its production.

1. Malaria is produced in the soil and emanates from it in certain localities.

2. The conditions of the soil and locality most favorable to its production are moisture, or alternations of moisture and dryness, with a free quantity of vegetable matter, in a low altitude, and where there is a large amount and long continuance of summer heat.

3. The upturning of virgin soil, or soil long undisturbed, and its exposure to a summer sun.

It is worthy of notice that these conditions are such as are favorable to vegetable life and growth, and they suggest the probability of the poison being a microscopic vegetable organism, but one which has as yet eluded distinct recognition. This will not be so surprising when we consider that with all the aids to our senses—the telescope for magnitudes and the microscope for the minute—we can still become cognizant of only a small area in the infinity of magnitude on the one hand, and of minuteness on the other.

There are certain conditions favoring the spread and reception of this poison into the system and promoting its effects there, which are sufficiently obvious. It seems to be attracted by moisture, and is carried from the earth by fog and vapor, and to whatever height they may arise the poison may be carried. Hence exposure to the night or early morning air in malarious regions, when vapors rise and prevail, is particularly dangerous. This has long been understood, and Shakespeare makes Portia reproach Brutus for "daring the vile contagion of the night" in malarious Rome. Winds may carry the poison to a greater distance—sometimes for a few miles from its source, but not farther—and a sheet of water interposed, which attracts it, or a screen of wood, serves to some extent as a protection. In free moving air, and especially when its oxygen is in an active condition of ozone, as it usually is in pine forests, the malaria is soon dispersed and oxidized, or in some way destroyed. Pine and cypress forests are regarded as opposing its effects.

Acclimation—accustomed exposure to malaria—has a decided effect in preventing and modifying its action; but complete exemption in all cases does not occur, at least until after some generations. The dark races, particularly the African, are much less subject to its influence than the white; and this is doubtless due to the influence of acclimation, of accommodation and selection during unknown generations in the malarious jungles of their native regions. Africans, at least after a few generations in non-malarious regions, become subject to the influence of the poison when exposed to it. Negroes in our country not unfrequently have the ague. In Africa they generally, if not universally, escape in regions where white men are intensely affected.

Though malaria is the essential cause of the whole ague series of diseases, yet there are certain predisposing causes which favor its effects. Those conditions are, fatigue, exposure—especially in the night—loss of rest, bad or insufficient food, irregularities, or anything which debilitates or deranges the system.

The period of attack after exposure to the specific cause, or the period of its incubation—the latent period of the poison—is exceedingly various. In what form the poison or its effects remain in the system during this period, and how it influences the organism or any of its parts, is not known. We only know that the exposed persons remain in apparently good health—it may be for a few days, or even for a few hours only, or it may be for some years—when the characteristic phenomena appear. Sometimes, however, the health seems to suffer in a general way, without definitely characteristic symptoms, for some time before the ordinary phenomena of ague occur; but not unfrequently there is no evidence of the presence of the malaria for long periods after any possible exposure to it at its sources, and then the disease suddenly appears. In these cases the attacks are apt to be recurrent and the disease more obstinate than when it appears soon after exposure and at the source of the poison. These facts are at present without satisfactory explanation.

Pathology.—We have considered the more perceptible phenomena of intermitting fever, and mentioned the principal known facts of its causes. It now remains to give an account of its Morbid Anatomy and Pathology, and its treatment.

In the absence of a knowledge of the character of the malarial poison, and the manner in which its effects are produced, we shall be prepared for the statement that its pathology is obscure; and we may add that morbid anatomy throws but little light upon it. We are confident that a poison, probably a living one, is taken into the system, and that by its own presence, or some peculiar substance or influence, the production of which it induces, a changed state results, and that for an indefinite period, at irregular intervals, more or less distinctly periodical attacks of fever occur, attended with rapid destruction of tissue, congestion of internal organs, high temperature, and the general perversions of a decided febrile state. We know further that the sweating stage tends to relieve the symptoms; and from the freedom and peculiar odor of the perspiration, and the relief following, we infer that in the paroxysm some injurious material is eliminated from the system. But where the original poison lurks, why it acts periodically, and how it produces its effects, we have not learned. There is, however, reason to believe that, whatever effects may or may not be directly produced by the poison on molecules, cells, and fibres of the various tissues, or upon the blood-vessels or the blood, the lymphatics or the lymph, or upon the substance and functions of any particular organs, impressions upon the brain and nerves, and the action of this nervous system, especially the sympathetic, have much to do in the production of the morbid results. It is probable that the enlargement and other changes of the spleen, the liver, and other glands, and the modification of their functions, however important they may be in inducing some of the morbid phenomena, are only secondary effects of deranged organic nerve action.

The most constant anatomical lesion discoverable after death is enlargement of the spleen. This organ becomes distended with blood, but whether more than its anatomical structure and connections will account for in the general internal congestions which occur, or whether there is some special influence exerted upon that organ, is not fully determined. Probably some special affinity exists between the poison and the spleen, and a special influence is exerted upon it. It is more susceptible to a morbid influence from the poison than other parts of the system, as different articles—medicines and poisons—operate specially upon different organs. The liver is also generally engorged and increased in bulk, and sometimes degenerated (amyloid). Congestion of considerable portions of the alimentary canal has been observed, and hemorrhage sometimes takes place from the mucous surface into the substance of the organs, and in recent cases the spleen particularly is soft and friable, and of a deep wine color. Portal congestions occur in all forms of malarial fevers, and congestion of the liver sometimes produces the nutmeg appearance.

In long-continued cases, where there have been many attacks, enlargement, hyperplasia, and induration of the spleen and liver are commonly found. Not unfrequently a dark or slaty discoloration of these organs is present, due, it is thought, to disintegration of blood corpuscles, and their conversion into pigment granules. In the liver minute extravasations of blood take place into the capsule of Glisson and the hepatic parenchyma, leading to the discoloration; and in the spleen, similar changes of the blood in the intermediate blood-passages take place. These pigment granules in the spleen are apt to escape and enter the general circulation, and becoming arrested in the capillaries of different organs, such as the liver, brain, and kidneys, cause them to be discolored, while interfering more or less with their functions. Various changes in the blood corpuscles have been noticed, but not with such frequency or uniformity of results as to justify definite statements on the subject. The proportion of white corpuscles is frequently very perceptibly increased, while the red corpuscles and the albumen are diminished, and the quantity of pigment is increased at the expense of the hæmatine. The lesions of the blood-producing organs—the spleen, liver, lymphatic glands—and mucous membrane of the intestines, and the destructive effect of the fever heat, account for the impoverished and changed condition of the blood.

TREATMENT OF INTERMITTING FEVER—AGUE.

The treatment of this, as of other diseases, may be divided into prophylactic and remedial. The prophylactic treatment of ague will be inferred from the account given of its causes. There can be no doubt of the propriety of draining marshy, malarious districts, when practicable, so as to prevent the accumulation of stagnant water in wet times, and the subsequent drying off which so encourages the production of the miasm. Many infected localities have thus been made healthy. The clearing away from such localities of dead and decaying timber, and the underwood and jungle, will also be important. The cultivation of new soil, though increasing the production of malaria in the earliest part of the process, results in the diminution and eradication of the miasm. As a rule, the older and more thoroughly cultivated a locality, the less ague occurs; but it should be stated that this rule is subject to exceptions, and that ague is occasionally found in old and well-cultivated localities. In the neighborhood of New York City this disease has prevailed for years past, and more recently it has appeared along the Connecticut River, and even among the hills of Western Massachusetts, where it was unknown before. In many places in the West, where ague was exceedingly prevalent in the early settlement, it has almost, and in some places entirely disappeared, as the localities became more thoroughly cultivated and densely inhabited. In and about Rome, though cultivated after a fashion for centuries, ague still prevails.

The inhabitants of malarious regions, during the season of the production of the poison, should be careful as to exposure in the night or early morning, when there is more of the poison in the air; should avoid getting wet, or lying or sitting upon the ground; should use only fresh, pure drinking water, or if this be not attainable, the water should be boiled; improper articles of food, excessive fatigue, and, in short, all debilitating and disturbing influences should be guarded against; and while persons are well no medicine is needed. The taking of repeated and long-continued doses of quinine, or other antimalarial specifics, for the purpose of preventing attacks, cannot be recommended. Should persons, as in the case of a marching army passing through a limited malarious region, be exposed but a short time to the poison, the system might perhaps with propriety be kept under the influence of the medicine while the exposure continued; but this suggestion rests upon theoretical considerations rather than upon experimental facts. In order that quinine should have a reliable effect in counteracting the influence of malaria, the system must be well saturated with it, and large and repeated doses must be given. This cannot be borne indefinitely without injury, and if smaller doses are occasionally given and attacks occur, as they are liable to, the system, having become accustomed to the quinine, fails to respond to it as promptly and certainly as in cases where it has not been thus used.

Whatever may be the explanation, the fact is well known to those of large experience in malarious diseases, that in repeated and long-continued use, the antimalarial power of quinine is diminished, and in some cases almost entirely destroyed. In the common language of patients, it becomes "worn out." In our late civil war, when the army of the Union was occupying the malarious Peninsula of Virginia, the practice was tried of giving daily rations of quinine and whiskey, but it was soon abandoned as useless, or worse than useless. In civil practice, with persons residing in a malarious region, this form of attempted prophylaxis is injurious. Even when attacks take place and are recurrent, great care should be taken that the virtues of quinine be not "worn out" by protracted use. The recommendation of Sir T. Watson, repeated by Bristowe, that persons residing in malarious regions, "on going out should wear charcoal respirators," from its impracticability, excites a smile; and the further recommendation that they should "also regularly take such remedies as are efficacious in curing ague," must be condemned. The additional advice that "persons who are actually attacked with the disease should be removed to some healthy locality," if strictly carried out among us, would have depopulated many of the fairest and now most healthy portions of our country. The best works of the best men, when dealing with subjects beyond their experience, are apt to be marred by similar impracticable or injurious recommendations. All practicable prophylaxis in this disease consists in improving the conditions of the locality, in avoiding night exposure (but here it must be remembered that air enters houses from without or respiration could not long be sustained), and in observing such hygienic regulations as tend to the preservation of vigorous health. When the disease occurs, it must be met by appropriate therapeutical treatment, and to a description of this we shall now proceed, aided by such lights as a careful study of the subject and a long and varied experience with malarious affections may afford.

The treatment of cases of intermittent fever is naturally divided into *symptomatic*, or that which is *palliative* of the paroxysm, and *radical*, or that which is *curative* of the disease.

The Palliative Treatment will, of course, be varied by the stage of the disease and the particular symptoms presented. Dr. Wilson Philips long ago announced the doctrine that we should endeavor to put an end to each stage by inducing that which is to succeed it. According to this, in the cold stage we should, by heat, warm drinks, etc., endeavor to bring on the hot stage, and in the latter, the sweating stage should be induced.

The cold stage is frequently so short or so light as to require little attention, and in ordinary cases, though it may be somewhat protracted and severe, little need be done. The patient naturally seeks external warmth, in which he may be indulged, but the relief obtained by it is not great. Special palliative means for this stage are required only when it is unusually severe, or when it occurs in the aged or feeble. In such cases the interference may be important.

As the chief pathological condition is that of internal congestion, with contraction of the external vessels, the spasmodically contracted external vessels should be relaxed and the blood should be invited to the surface and extremities. External warmth and irritation, hot air or warm water, or mustard baths, warm packing, warm bottles, etc., as recommended in some cases of simple fever, will have some effect.

Blood may be retained in the extremities by their ligation, putting a fillet about the thighs and the arms near the shoulder, so as to detain a portion of the venous, but not to interrupt the arterial flow. This necessarily diminishes the quantity in the internal organs, and thus often produces great relief to those distended and suffering parts, and also to the sensations and general depressed condition of the patient. The chilly sensations are often by this means remarkably relieved. The free application of dry cups and the use of Junot's cupping-boot are other means for accomplishing the same purpose. A bleeding will check the cold stage, as long ago shown by Dr. Mackintosh, of Edinburgh, and might be properly practiced in cases of decided plethora, but it is almost always unnecessary, and would generally be injurious by depriving the system of its needed circulating fluid, and tending to increase the anæmia and debility so constantly following the disease. Still, the injury and danger of the loss of blood are often exaggerated, and present relief to all the disturbing symptoms would frequently be obtained by it. Not only former practice, but the occurrence of spontaneous hemorrhages supports this statement.

Other means for relaxing spasm of external vessels and relieving the internal congestion and depression may be required. Opiates, chloroform, ether, camphor, ammonia, etc., are remedies applicable to this state. Chloroform in doses from half a drachm to a drachm, in a proper vehicle, by the stomach, generally produces very speedy and marked relief. Ether produces a somewhat similar but less powerful effect; and a decided dose of laudanum, morphine, or some other form of opiate, will answer the indication admirably, especially if the patient is suffering from pain. When this cold and depressed stage is accompanied with profuse serous vomiting and purging, as is sometimes the case, opiates are imperatively demanded.

The nitrite of amyl is said to be quite efficient in bringing on reaction and abbreviating the stage of chill. Pilocarpin has recently been reported as exerting a remarkable influence when administered as the chill is coming on, arresting it and substituting the sweating stage, and preventing the occurrence of the usual hot stage. It is also alleged that this treatment is radical, preventing the recurrence of paroxysms in a considerable proportion of the cases. It is administered hypodermically, in doses for an adult of from one twelfth to one sixth of a grain of the nitrate or muriate of the pilocarpin at the time the chill is about to occur, or it may be given in a corresponding dose of from one sixth to one fourth of a grain by the stomach, half an hour before the expected chill. Should these favorable reports be confirmed, we have an additional remedy for combating this disease; but longer and more varied experience is required to establish its efficacy and safety.

In these depressing chills, warm drinks, spiced teas, hot coffee, etc., aid in relieving the depression. It is only in exceptional cases that any of these means will be needed, but when required, great promptness in the application, and discretion as to the selection, the size, and the repetition of doses, will be necessary.

The sufferings of the patient are usually greater in the hot stage than in the cold, though the danger may not be as great as in the exceptional cases referred to. Although the fever is of so high a grade that, if long continued, serious consequences might follow, yet the system can endure a very severe fever for a short time, and during the period of apyrexia it, to a large extent, recovers its tone, and the rapid degenerations which attend continued fevers of so high a temperature are avoided. The sufferings to the senses of the patient, while the fever lasts, are great, and often demand palliation.

The patient should be in a cool, well-ventilated room, his covering should be light, he should have plenty of cold drinks unless they oppress his stomach, which is not usual, but if so, he should take a small quantity often. Bits of ice may be allowed when desired or agreeable, and the application of cold, cool, or tepid water, or vinegar and water to the surface, as most agreeable, by sponging, packing, or affusion, is exceedingly grateful and relieving. Cold, to the head particularly, is useful, not by a small wet cloth placed now and then upon the forehead while the back of the head is buried in a hot feather pillow, but by means of large towels wrung out of ice-cold water and wrapped about the whole head, and changed as soon as they become a little warm, two such being used, one remaining in the water while the other is on the head. The general bath, where there are conveniences for it, would be useful, but the sponging is always available, and, in severe cases, should not be neglected. To be most effectual it should be thorough, free quantities with large sponges being rapidly applied, and a blanket placed under the body to protect the bed.

Not unfrequently nausea, vomiting, or severe gastric distress, with great thirst and intense general suffering, are present, calling for additional measures of relief. Nothing is more efficient for this purpose than about one quarter of a grain of morphine, dissolved with twenty grains of tartaric acid, in half or two thirds of a tumbler of water, with about twenty grains of bicarbonate of soda dropped into the solution when ready to be taken, and the whole taken while effervescing. The patient may often thus be transferred from a state of the most severe suffering—of pain in almost every part of the body—to one of absolute enjoyment, the contrast making him very happy and grateful. If we may say *her* instead of *him*, that gratitude will not disappear with the effect of the dose. If the stomach should immediately reject such a draught, as is possible but not probable, the morphine may be used hypodermically, or, which will often answer nearly as well, the morphine, in powder, may be dropped far back upon the tongue, and a tea-spoonful of water taken after it. Used in this way, it is speedily absorbed by the mucous membrane, and no act of vomiting is likely to dislodge it. After a few minutes, its rejection is impossible. If the paroxysm is protracted, similar effervescing mixtures may be repeated often, but generally without further additions of morphine; or half a teaspoonful of a mixture of three parts of bitartrate of potash and one of bicarbonate of soda, in half a tumbler of water, taken as it slowly effervesces, and repeated *ad libitum*, will be very grateful, and will act as a gentle laxative and diuretic.

In the administration of soda or Seidlitz powders, instead of dissolving the ingredient in separate quantities of water and adding the solutions together, one of the powders should first be dissolved in the necessary quantity of water, and the other added in a dry, well pulverized state. This will secure a slower effervescence, and give time for it to be taken before it is dashed over, and before the carbonic acid has so nearly escaped. The powder most difficult of solution should first be dissolved in the water with the sugar, if that be used, and the other added when ready to be taken.

What appear to be *small* matters of this kind in administration and management, are by no means so in their results, either in success in treatment or in obtaining and securing patients. They are, therefore, mentioned with such particularity.

In children, not very unfrequently, convulsions occur, sometimes during the cold stage, oftener, however, in the early part of the hot stage, but while the internal congestion is still decided. In these patients the cold stage is not so strongly marked as in the adult; there is more of the mingling of the cold and hot stages, but the congestion is as decided and the irritation as great, and, as is well known, their susceptibility to convulsive movements is much greater. These convulsions will be most speedily relieved by the administration of chloroform, either by inhalation or by the mouth. The warm bath aids in producing relaxation; while, if the fontanels be prominent, or evidence of fullness of the cerebral vessels is present, cold should be applied to the head and revulsives to other parts. As children are so liable to have gastric and intestinal irritation from undigested food or morbid secretions, emetics sometimes, and cathartics generally, are useful; the latter aided in their speedy operation by enemas. They relieve the brain by their revulsive effect, as well as remove irritating matters from the alimentary canal. Castor-oil, sometimes with the addition of a few drops of the oil of turpentine, or a grain or two of calomel, is generally preferred as a cathartic. By careful attention, and timely administration of the chloroform or other anæsthetics, the convulsions can generally be controlled. In all such cases curative treatment, or treatment preventive of the recurrence of the paroxysms, must be promptly applied. This promptness should be observed in any case, either in children or adults, where severe or unusual symptoms occur.

In the hot stage of ague, as well as in the cold, severe serous vomiting and purging may come on, and occasionally bloody discharges from the bowels take place. Both the cold and the hot stages may be merged in an attack of cholera morbus, as already described. In these cases the most prompt measures are demanded. The great remedy here is opium in some form or combination. The use of morphine in the manner already described will often answer the indication, but still more effectual in arresting these discharges is the following compound:

℞	Opium,	
	Camphor Gum................	āā grs. ij
	Calomel.......................	grs. iij
	Sugar of Milk..................	grs. xv
	M.	

Rub up into a *very fine impalpable* powder. This should be dropped into a tea-spoonful of water, and taken far back in the mouth, followed by a single small swallow of water. The most favorable time for its administration is immediately after an act of vomiting. The importance of the minute division especially, and the combination with the camphor, favoring its ready diffusion in the stomach and application to its walls, cannot be too strongly insisted upon when a speedy action is required; and its administration with a small quantity of fluid is important. The dose may be repeated soon if the first appears to be rejected, or within an hour, more or less, if the symptoms are not arrested. Discrimination as to quantity and repetition of doses, according to the effect produced, will of course be important, but a full medicinally narcotic effect is usually required. Free doses in these cases are commonly well borne and demanded. Sinapisms, or dry cups over the stomach, or the ligation of the extremities, may aid the effects of the other treatment. To secure the retention and effect of the powder, only very small quantities of fluid for some time after must be taken into the stomach, or until an anodyne and quieting effect is produced. Any ordinary medicine diffused in a large quantity of fluid in the stomach, especially when that fluid is being frequently rejected and replaced, can have little effect, and if opium be in the form of a pill or a coarse powder, it is likely to have no effect at all. Neglect of these considerations may render treatment entirely nugatory in cases where the most prompt action of the medicine is essential. Exhaustion and collapse are liable to follow such attacks when not controlled. These violent symptoms are more likely to occur in the severer varieties of malarial fevers, but they sometimes appear in the strictly intermitting forms.

The sweating stage requires no interference. The patient should be permitted, if not encouraged, to sweat; and nothing further than a tepid sponge bath, and a change of clothing after the sweating has subsided, is required.

But the radical or curative treatment is most important, and is called for in all cases. Expectancy, or the "conducting through" system is entirely inapplicable here. We have means here of positive and very effectual interference, and this should encourage us to hope that other means as effectual in other diseases may be found.

We have for ague a class of special remedies well known and acknowledged as acting in some way very specifically upon the essential morbid condition, either by neutralizing the poison by a direct action upon it, or by so impressing the system as to render it insusceptible to its full effects. These points are well established, and what we now have to consider is the choice of articles, the particular methods of their use, and the collateral or necessary means which may be required to give them most effect, and to restore the system to its healthy state. The first question presenting itself is as to whether any preparatory treatment is required to give greater efficacy to the specific measures. On this, differences of opinion have been expressed. The experience of many years, and the witnessing of the different modes of management have furnished me with very positive opinions on this as on other points connected with this disease; and I may be pardoned for expressing these opinions somewhat dogmatically. If called to a patient at a very early stage of the disease, as during the first paroxysm coming on suddenly in the midst of health, the bowels being open, the stomach not oppressed with undigested food, and the secretions not yet materially perverted, the specific antimalarial remedy may be given without preceding treatment, and the paroxysms may be thus arrested at once. If derangements of the secretions follow, or any other morbid states linger, they may be dealt with afterward according to their indications. The palliative treatment already described, in those cases where it is needed, is in a degree preparatory; but as patients are generally seen, some other and more particularly preparatory measures are required.

In the hot stage when somewhat protracted, as it usually is in the first paroxysm or two, a cooling saline cathartic, especially if preceded by a few grains of blue mass, hydrarg. cum creta, or the mild chloride of mercury, will act decidedly as a palliative to the fever and the symptoms generally, and at the same time will prepare the system for the more efficient and agreeable action of the specific remedy.

In short, as patients are generally seen, after the disease has continued some little time or when prodroma have occurred, where the tongue is coated, the eyes and skin yellow, the bowels perhaps constipated, and the secretions generally deficient and deranged, and where effete matters have already accumulated in the blood, eliminative treatment, especially by a moderate mercurial and a saline cathartic, and sometimes by diaphoretics and diuretics as recommended in simple fevers, may with the greatest advantage precede the antiperiodic.

The ultimate results are best where such preparatory treatment is instituted. As a rule, then, from four to eight grains of blue mass, with perhaps from fifteen to twenty grains of bicarbonate of soda should be given, followed in a few hours by a dose of citrate or sulphate of magnesia, or sulphate of soda, or Rochelle salts, sufficient to secure a cathartic operation. This will modify the secretions, eliminate irritating and effete matters, and prepare the system for the more ready absorption and better operation of the antiperiodic or antimalarial remedy. Dr. Livingstone found that in the intense malaria of the jungles of Africa, when his men were attacked with the fever, a decided cathartic followed by prompt doses of the antiperiodic produced the best results, and this is the general testimony of those who have had large experience in the disease.

There can be no doubt of the superiority of the cinchona alkaloids, particularly quinia and its salts, over all other known agents, as antimalarial specifics. The sulphate is the article in more common use, and is the one intended when the single word quinine is used.

After the management above indicated, in an ordinary case of ague, from ℈j to ʒss of quinine should be divided into four or five doses, and, commencing with the first intermission, the doses should be repeated sufficiently often to have the whole taken some hours, if convenient, before the time for the next paroxysm. *The whole quantity needed should by all means be given during the intermission and within a few hours*—should make but a single, or one continued impression. If the intermission is a short one, the type quotidian, and the paroxysm protracted, the doses must be repeated more frequently, or diminished in number but increased in size; but on no account should less than the whole quantity needed be given during one intermission. Some cases will yield to less than twenty grains, but the larger doses are harmless and more certain and complete in results, and in all, excepting very unusual cases of remarkable impressibility or special idiosyncrasy, the quantity mentioned should be given.

With some persons quinine produces a sense of fullness and confusion in the head, ringing or roaring in the ears, and temporary deafness, and, less frequently, a feeling of stricture in the chest, and a sense of suffocation. These nervous disturbances have received the name of "quininism" or "cinchonism." They are always temporary, and may be said never to result in serious consequences. Some writers regard these symptoms as evidences of the full medicinal effect of the quinine, and advise its suspension whenever they appear. To suppose that they indicate the full antimalarial influence of the quinine is a *mistake;* and where a prompt arrest of the disease is, from the occurrence of grave symptoms, important, this opinion, with the practice based upon it, is a *very serious mistake.* From fifteen to thirty grains of quinine should impress the system at one time, and as elimination commences in three or four hours after the medicine is administered, though the effect of a dose remains some hours longer, the propriety of its administration in large or very frequently repeated doses will be seen. Some advise the whole quantity necessary in a single dose, but it is more likely to be absorbed and to be effectual in its operation when given in a few frequently repeated doses. With some persons two or three grains of quinine will cause more or less of the symptoms of quininism, and often quite markedly; but that quantity will not arrest the paroxysms of the disease. This cinchonism *is no adequate measure of the curative effect of the quinine,* and as it is temporary and unimportant, it should not be regarded in administering the remedy. It cannot be too distinctly urged that a certain quantity of the antidote is necessary to be in the system at one time in order to neutralize the malarious influence, and that quantity must be given. When it is given and absorbed, and especially after proper preparation, it *does not fail* to arrest ordinary agues, and is sufficient without repetition or *the continuance of the remedy.* The protracted use of quinine, as so frequently advised in some text-books, is unnecessary and often injurious. These views, if correct, as I am sure they are, should be particularly emphasized, as they are not only important, but are contrary to the more common recommendations on the subject. I can but insist that the practice of giving small and long-continued doses of quinine in ague, is treatment not only always less effectual and less certain than the course here recommended, but is often *bad.* While many cases will not be arrested by this method, and will go into a chronic form, the system will become so accustomed to the use of quinine that it will fail to respond to its curative effects, even in large doses, and a greatly protracted continuance of the disease, with all its evil consequences, will often result. So many cases of this kind have fallen under my observation, which I am sure would have been avoided by prompt and efficient treatment at the beginning, that the strongest expressions on the subject can alone satisfy me. As quinine is now well known to be a direct antipyretic remedy, diminishing in a short time feverish heat when given in free doses, it might be inferred that the best time for its administration would be in the height of the febrile paroxysm. Malarial, as well as other fevers, are capable of having their heat directly abated by free doses of quinine, and an influence in preventing a return of the paroxysms is exerted at the same time ; but experience has proved that this preventive effect is exerted more certainly and more powerfully when the medicine is given during the period of apyrexia. The reason of this may not be apparent, but this does not affect the fact. Dr. Binz, of Bonn, whose writings on various subjects have given his opinions weight, says ague is cured best by quinine in the period of apyrexia, when the poison is latent, and when the nervous system, the heart and respiratory organs are free and more normal in their functions. It may be because, during the intermission, it is more readily absorbed from the stomach and received into the tissues ; and the reason of its acting more efficiently after a cathartic and other eliminative treatment probably is, that it is more freely and promptly appropriated. At any rate, in some way it more readily reaches and acts upon the cause of the disease during an intermission, and after "preparation." The facts are far more important than the explanations ; and they teach that eliminative or preparatory treatment is often important ; and that quinine acts more efficiently and certainly when given in full quantity *during one intermission.* Directions differ as to the particular time during the intermission when the quinine should be administered. This is not a material point, provided the whole quantity is taken into the system, and produces its effect before the time for the next paroxysm. As a rule, it is best to commence during or immediately after the sweating stage, and to give it, in from three to five doses, once in from two to three hours.

The mode of administering it is worthy of attention. It is frequently advised to be given in solution, with the addition of sulphuric acid. It is efficient in this form, but is very unpleasant to the taste, and is more likely than in other forms to irritate the stomach. Compressed masses or pills, especially when the pills are covered with gum, and have been long kept, are slow in dissolving in the stomach, and may fail to act in time; or when the bowels are loose may pass through the alimentary canal without producing any effect. In cases of severity, requiring promptness, these accidents should be carefully guarded against. On the whole, perhaps the best method of administering is in French wafers, or in gelatine capsules, which are known to be readily dissolved. When the bitter taste is not objectionable, there is no better method than to give it in a simple powder in any common vehicle.

When all these precautions are taken, and the foregoing directions are carefully followed, nothing in medicine, and scarcely anything in physics or chemistry, is more certain than that, in common ague, prompt interruption of the paroxysms follows; and if the treatment be commenced at an early period of the disease, before the system has become saturated with the poison and more seriously deranged and depraved by its effects, the cure is generally permanent, at least until a considerable time of further exposure to its cause has occurred. The longer the disease is permitted to continue, the more likely it is to return when interrupted. Hence the importance of prompt and *early* treatment.

Whether quinine produces its effects in arresting malarial fever by acting directly upon and destroying the poison, or by its impression on the system so as to render it insusceptible to the action of the malaria, is not determined. Some facts seem to show its operation in one way, and others in the other.

It is known to be a powerful antiseptic and antizymotic, and it is believed, therefore, to act chemically upon the malarial ferment. But it is also known to act powerfully on the system, and to be capable of diminishing fever heat from whatever cause. It diminishes urea and uric acid, exerts apparently a direct influence upon the spleen, diminishing its vascularity and the formation of uric acid in that organ, which is alleged to be its chief source. It markedly diminishes the number of white blood corpuscles so abundant in the spleen. It acts directly upon protoplasm, it is said, independently of nerves, and yet it impresses the nervous system. It diminishes heat independent of changes in the heart's action, and yet, in free doses, it diminishes the frequency and irritability, and often the force, of that action. The facts certainly indicate that it produces its effects in part, at least, by its action on the system. This view is further supported by the additional fact, sufficiently proven by experience, that its effects may be markedly diminished or lost by its long-continued use. This must be from a changed state of the system, rather than of the poison within it, which cannot be supposed to be long identical. It probably operates in arresting ague in both ways—by acting upon the poison and the system. But the full mode of its operation we are not at present able to determine, and must be content with knowing its singular power in arresting malarial and various other diseases.

The after-treatment, if any be required, must be governed by the conditions present. If the organs resume their proper functions, if the bowels are regular, the tongue clean, and the appetite and nutrition normal, no treatment beyond proper hygienic precautions will be required. As already stated, the practice of continuing the use of quinine, in either large or small doses, is at least unnecessary, and is not advisable. If the disease has continued long, and there is marked anæmia and debility, the preparations of iron and other tonics may be required. If, as is very likely to be the case, the liver remains torpid and the secretions generally are deficient or perverted, and there is evidence of effete matter remaining in the system, *eliminatives will be demanded,* and will often do more in restoring strength by improving nutrition, than tonics. Indeed, in many such cases, tonics, especially given alone, are injurious. A combination of eliminatives and tonics will often be useful, or eliminatives for a few days, and tonics afterward. An old combination and a useful one, is sulphate of magnesia or sulphate of soda and sulphate of iron in some bitter infusion, so that a drachm, more or less, of the laxative and two grains of the tonic, be taken three times a day. Dr. Graves' mixture of sulphur, cream of tartar, carbonate of iron, and electuary of senna, may be well as combining tonic and eliminative properties. But sometimes eliminatives alone are required. Indeed this is often the case.

A favorite with Dr. Golding Bird was acetate of potash, in scruple doses, three or four times a day. Lately, the tinct. of iodine has been strongly recommended as an antimalarial remedy ; but, by noticing the reports, it is found to have been used in chronic and relapsing cases, and continued for some time, after other antiperiodics had been given ; and the question is suggested whether it is not its eliminative effect, rather than any specific antimalarial power, which has given it its reputation. It is very frequently found, in chronic cases that have often relapsed, and where the tendency to a spontaneous termination is present, that a cathartic, followed by doses of acetate of potash, hydrochlorate of ammonia, or any similar depurative agent, will effect a prompt and often permanent arrest of the disease.

Further experience is required to test the full efficacy of the iodine, and there is much reason to fear that if relied upon in acute or recent cases, disappointment would be the result.

But whatever virtues other agents may have, all the pathological conditions in malarial fever are simultaneously destroyed or greatly modified by quinine, as by some fundamental change-producing curative power.

If there be much irritability of the stomach, or of the general system, an ordinary dose of morphine may be given just before or added to the first dose of quinine, and perhaps to one or two subsequent doses. The quinine by that means will be better borne, more readily retained and absorbed, and its antiperiodic effects increased and rendered more certain. Indeed, morphine alone exerts an antimalarial influence, as a decided dose will sometimes arrest the paroxysms.

The other preparations of cinchona, though less reliable than quinine, are generally quite efficient in arresting ague, and as they are less expensive may often be used as substitutes. They, too, must be given in free doses in order to produce decided and prompt effects. Quinidia in but little larger doses, and cinchonia in twice the doses of quinine, are quite efficient.

Though no other antimalarial remedy is as effectual or reliable as the preparations from the Peruvian bark, especially quinine, yet there are other medicines capable of arresting the ague. Among these, arsenic has the most established reputation. It is commonly given in the form of Fowler's solution, in doses of from six to fifteen drops, largely diluted with water, and repeated in from three to six hours until the paroxysms are arrested. The French advise the arsenious acid simply, in sugar of milk, or in solution in distilled water, and in doses of from half to two or more centigrammes (from one fourteenth to a quarter of a grain), repeated once in a few hours. It is liable to irritate the stomach and bowels, and if the tongue becomes red, or is thoroughly coated with a silvery-looking fur, or the conjunctiva is irritated, and puffing occurs about the eyes, or if there is tenderness or pain at the epigastrium, or if nausea and vomiting, or diarrhœa come on, it must be discontinued, and eliminative and soothing remedies resorted to. In some chronic cases, where quinine has been frequently given, and its effects have diminished, arsenic may be substituted with advantage. In recent cases, however, it is much less prompt and efficient. Similar preparation for its use is required as with quinine, but the same rule with regard to giving the necessary quantity during a single intermission is not applicable.

Salicine is another article which has decided antimalarial powers. In doses somewhat larger than quinine, but given in a similar manner, it often acts very promptly in arresting the disease. When the preparations of bark are not well borne, as, for instance, in women of peculiar idiosyncrasies, where quinine induces uterine hemorrhage and other unpleasant effects, the salicine may be substituted with great advantage.

The eucalyptus globulus is another remedy which has come into use within a few years past, and its virtues as an antiperiodic are by some highly extolled. It certainly has antimalarial powers, and is said to act in all respects very similarly to quinine; but how far it may be relied upon as a substitute for that article, has not as yet been sufficiently determined. The most eligible preparation is the fluid extract given in drachm doses, and repeated once in three or four hours. In chronic cases I have frequently given it in connection with quinine, and it has seemed to me to increase the efficiency of the quinine, especially where the effects of the latter had been weakened by repeated use.

Cornin, the active principle of Cornus Florida, deserves to be mentioned as an antimalarial remedy, and may be used in the absence of the more efficient article.

Hydrastin is another article having decided antimalarial virtues, and is regarded by some as next in power to the alkaloids of cinchona.

Chloroform will sometimes arrest the ague, and so will the sulphites, berberina, and various other substances; but they are less reliable, and therefore should be depended upon only in exceptional cases.

The tinct. of iodine, already referred to, is advised in doses of ten minims from three to five times a day, and the following mixture of iodine and carbolic acid has been recommended as highly efficient:

℞ Acid Carbolic .... ʒj
Tinct. Iodine comp.................... ʒiij
M.

Four drops every four hours in sufficient water.

In chronic cases and for the removal of some morbid alterations produced by malaria, a combination of iodide of ammonium and arsenic is advised. To five grains of the former three drops of Fowler's solution are added, and given three or four times a day.

There are various other compounds recommended by different individual practitioners, but none have a sufficiently wide and established reputation to require particular mention.

Whether other antimalarial remedies than quinine operate by directly acting upon and destroying the malarial poison, or whether they so impress the system as to render it insusceptible to its influence, or whether they induce actions in the body which result in the destruction or expulsion of the poison, is at present unknown.

The treatment of an uncomplicated case of common ague is sufficiently simple, and may be summed up and repeated in a few words. As patients are usually seen, it consists in the administration of a cathartic—a mild mercurial, followed by a saline, being generally the best—and after its operation, during the next succeeding intermission, of from fifteen to thirty grains of quinine in from three to five doses. In many cases nothing more is required, but others may occur calling for the other means described.

The relapsing cases are those which will give the physician most annoyance, and which will most severely tax his skill and patience. Here eliminative treatment must not be neglected; and a few large doses of quinine, rapidly repeated, will often arrest the disease promptly and permanently, where smaller doses, at longer intervals, had been given for a long time without satisfactory results. When the attacks have several times returned at regular periods, as once in one, two, or three weeks after their interruption, an antiperiodic quantity of quinine, given the day before an expected return, may be effectual in preventing any further attacks. The habit of recurrence may thus be broken up.

The Chronic Enlargement of the Spleen, as a sequel or accompaniment of ague, is to be treated by effectually destroying the malarial influence by the means so fully dwelt upon; and afterward, by keeping the bowels open, and by the use of iodide of potassium internally, and by the daily application of the ointment of the biniodide of mercury over the region, thoroughly rubbed and heated in, until decided counter-irritation is produced. A ℥ss, more or less, may be applied each time. Quinine seems to have a direct effect in diminishing the calibre of the splenic vessels and the size of the organ, and, once in a few days, a few free doses of it should be given, the other means mentioned being continued through the interval. If much anæmia is present, iron should be added. These means are usually effectual, often speedily so, in removing the enlargement which has not continued too long, and which is the result of ague.

When dropsical symptoms follow or accompany ague, the malarious influence should first be effectually removed, and then eliminative and tonic remedies will be required. By removing the malarial influence its effects will tend to cease; but the eliminative cathartics, diuretics, and sometimes diaphoretics, will aid in removing the accumulated fluids, carrying off at the same time other morbid materials from the system; and then the use of tonics, such as the tincture of iron and other agents tending to improve digestion and nutrition, will aid in restoring health.

When what is called Dumb Ague occurs—the malarious poison operating injuriously upon the system, but without producing the ordinary phenomena of well-marked chill, fever, and sweating—the same general course of treatment should be pursued as in the more regular forms; and the remedies should be applied with even more promptness, as the deterioration of the system is more rapid than in well-expressed cases. The same preliminary eliminative measures, the same prompt and efficient antimalarial remedies, will be required, and the same rules as to treatment afterward must be observed. The only material variation is, that, after the operation of the cathartic, the quinine may be commenced at once with less regard to periods, as no distinct paroxysms occur. Still there are periods of abatement of the symptoms, and such periods would be preferable for pushing the quinine. Here, as elsewhere, a full antimalarial quantity should be given within a few hours. This point is often repeated and insisted upon, as it is so important, and as many of the text-books, written by those practically unfamiliar with the disease, advise a different course.

Various anomalous symptoms occur as the result of the malarious poison, all of which require the antimalarial treatment. They are generally marked by some degree of periodicity, but this is not always conspicuous; and much care and discrimination may be necessary to detect the true character of the obscure cases. As the antimalarial treatment is comparatively so innocent, and is often useful in other than malarial diseases, it should be resorted to whenever there is reasonable suspicion of a malarious cause.

In aguish localities other diseases are often modified by the malarial influence, assume a degree of periodicity, and require prompt antimalarial treatment. Frequently the removal of that element changes greatly and most favorably the whole character of the case; and scarcely any condition of disease forbids the use of quinine when indicated by a malarial complication.

REMITTENT MALARIAL FEVER.

This is a severer form of malarial fever than common ague, marked by exacerbations and remissions, but without periods of apyrexia. The cause of all the malarial fevers being the same poison, remitting fever is but a modified variety of the same specific disease. Produced by the same cause, it has many qualities in common with intermitting fever, and they shade off into each other, some cases not answering the ordinary descriptions of either; and yet in their typical forms their phenomena are quite distinct, and in many respects dissimilar.

In remitting fever there are the rudiments of the four stages so clearly marked in intermittents, but none except the second, or stage of fever, is fully developed. This stage is generally severe, and always protracted, while the abatements vary in duration and degree. The exacerbations vary in the time and frequency of their occurrence, and in their severity and danger. They may recur daily, presenting a quotidian type, or every second day, presenting a tertian; or they may be irregular, sometimes two or more exacerbations occurring in twenty-four hours. This fever is often accompanied with local irritations, congestions, and inflammations of a decided character, and as these occur in the stomach, the intestines, the liver, or other organs, different varieties of the fever result.

The leading symptoms are very similar to those of the hot stage of ague. The more decided attacks are sometimes preceded by prodroma—by gastric and hypochondriac uneasiness and sense of weight, by general pains, slight feverish sensations, deranged secretions, coated tongue, etc. Sometimes, however, the access is without premonitions.

When the attack fully sets in, it is commonly abrupt, and the symptoms are decided. Usually, at first, rigors mingle with the sensations of heat, and sometimes the chill is quite marked, but seldom as much so as in ague. The temperature of central parts is always raised, and very soon external heat of all parts is manifest, even though sensations of coldness are by turns experienced.

The pulse at the beginning is variable. It is often small during the rigors, but usually full and free as they disappear. While the chilliness is felt the lips are more or less blue, and there is often nausea, and sometimes vomiting. Soon the full hot stage is present; the lips lose their blueness; the whole surface is red, suffused, and expanded, the respiration and pulse are hurried—the latter not exceedingly rapid or tense, generally full and open, and not much above one hundred. There is much thirst, severe pain in the head, back, and limbs, and there are sensations of great general distress and weakness.

Usually in from six to twelve hours there is some abatement of these severe symptoms, and there may be slight moisture. The temperature during the height of the fever being from 104° to 106°, continues, at the abatement, decidedly above the normal, and sensible perspiration by no means always occurs. As the case goes on, the tongue becomes heavily coated, is often dry and hard, frequently red at the edges, and sometimes over its whole surface; the secretions are greatly perverted; the spleen and liver congested and swollen, and sometimes inflamed; more or less yellowness of the eyes and skin often occurs; the urine is dark-colored and heavily loaded with urea, urates, uric acid, and often with bile; and with many persons delirium is present, sometimes quite active, at other times low, while in other cases it is but slight, and in many it is absent. These symptoms, with the fluctuations, may go on, without other material changes, for many days. If, however, the case be long neglected or badly treated by irritating emetics or cathartics, the remissions often diminish, the fever becoming more uniformly continuous and severe, gastro-intestinal inflammation resulting, with tenderness of the epigastrium particularly, and more or less of the whole abdomen. In these cases the tongue is coated and dark, or red and glazed, but in either case dry and hard; great thirst and burning pain of the stomach are often present, with vomiting of yellowish, green, or bluish, brownish, or blackish matter; and sometimes diarrhœal—watery and briny, or dysenteric—mucous, and bloody discharges from the bowels take place. In other cases the liver, spleen, or brain suffers more, and occasionally, though rarely, a deeply jaundiced condition with almost bronzed skin appears. At any period of the disease free bilious discharges cause relief, not only of the discoloration, but of all the general symptoms.

There may be severe pains, delirium, stupor, partial paralysis, and great depression from the more direct effect of the malarial poison upon the general system, without special local disease.

Usually, when the disease is left to itself, in from one to three weeks a change of type or condition occurs. There is either abatement of the severity of the fever, the remissions increasing in length and degree until intermissions occur; or a more continued, irritative, typhoidal fever supervenes, or death occurs.

When marked spontaneous improvement takes place, it is usually accompanied by critical discharges, a free perspiration, bilious evacuations, or herpetic eruptions—often by all of these simultaneously.

Some cases, left to themselves, are protracted for many weeks, but result in final recovery, though for still longer periods with blood poisoning and organic and vital impairments. Often, however, there comes at length failure of vital power; a small, feeble, frequent pulse; livid, yellow, or even rarely a bronzed skin; tympanitis of the abdomen; briny or mucous stools; low delirium or stupor; involuntary discharges, pinched features, and death.

Remitting malarial fevers are varied much in their peculiarities, their severity, their complications and their course, by climate, locality, season, and by constitutions and habits. As a rule, they are more severe the greater and longer continued is the season of heat; and in the Northwest, while agues may prevail in the spring and late autumn, in August and early September remitting forms are generally more prevalent. But both intermitting and remitting forms occur at the same time and in the same locality, and each may assume the form of the other, and both may run into a continued fever with no more variations than occur in typhoid or simple fevers; and the various complications already mentioned may occur, increasing their severity and danger. Occasionally a malarious fever occurs with scarcely any remissions throughout its course; and not unfrequently for the first few days the remissions are very slight. Not only may a malarial fever assume a typhoidal type, but a genuine typhoid fever may coexist with and complicate it; both the typhoid and malarial poison operating on the system at the same time, producing what has been called a typho-malarial fever. These cases will require to be noticed after describing typhoid fever.

MORBID ANATOMY.

The opportunities of post-mortem examinations have been more frequent in remitting than in intermitting fever, but as the diseases are specifically the same, the essential pathological conditions are similar. In acute cases, when death occurs, congestion and inflammation of various organs are usually found, congestions of the spleen and liver are constant, and these organs are generally otherwise changed. The spleen is of a dark wine color, enlarged and softened, and sometimes ruptured. Dark coloring matter from transformation of the red blood corpuscles is often found in its vessels, sometimes in great abundance, and their pigment is often deposited in other organs as well. The spleen is sometimes found inflamed; and when several attacks have previously occurred, and the patient has been long submitted to the malarial influence, this organ may be enormously enlarged by exudates and hyperplasias, and various degenerative changes may have taken place. In acute cases the liver is enlarged, is of a brown or slate color, or mixed gray and olive, the nutmeg appearance being sometimes presented. The pigmentation is sometimes marked. In more chronic cases the liver is often enlarged by exudations and by hyperplasia, is decidedly pigmented, and amyloid degenerations are sometimes found. Not unfrequently inflammatory changes are present—in acute cases, parenchymatous hepatitis sometimes goes on to suppuration; and in cases of long exposure to malaria in low latitudes, chronic abscesses may be found as complications.

In most cases where death occurs from a first attack of remitting fever, other organs are much congested or inflamed. The mucous membrane of the stomach and bowels is often intensely congested, and sometimes hemorrhagic—blood being infiltrated into its tissue and effused upon its surface, which accounts for the brown or black vomit and briny intestinal discharges which sometimes occur. Inflammatory softenings and exudations are also often found.

Pigmentary exudations are sometimes found in the brain, and occasionally that organ and its membranes are inflamed.

Sometimes the lungs and the bronchi are involved in inflammation; but inflammations of the abdominal viscera are more frequent.

The blood, as in cases of intermittents, is changed. The white corpuscles are increased and the red diminished. It is often loaded with pigment and bile, and sometimes with an excess of cholesterine. In some cases the blood corpuscles have been found disorganized in large numbers, so that death has been supposed to be produced by necræmia.

Here, as in other fevers, the kidneys are sometimes found diseased, and the impairment of their functions, here as elsewhere, leads to retention of effete matters and blood poisoning.

Diagnosis.—The Diagnosis of Remitting Fever is particularly important, as the treatment is specific; and to distinguish it from some other conditions is sometimes by no means easy. In the early stage the phenomena are scarcely distinguishable from those of severe accidental fevers; and they as nearly resemble those of the occasional typhoids whose attacks are sudden and abrupt. There are some general features, however, which are distinguishable by careful and repeated observations, but which it is more difficult to describe. The accurate and experienced observer, taking into account the locality and season, can usually come to an early and proper conclusion. Jaccoud mentions an icterode condition of malarial fever as the distinguishing characteristic; but this is by no means always present, and that condition is not unfrequently a symptom of accidental fever, and sometimes is present in typhoid.

In all ordinary cases the severity of the early symptoms, the remitting character soon manifested, and the bilious derangement, with the absence of the common causes of accidental fever, and, above all, the malarious character of the locality, will leave but little difficulty in the diagnosis. As remitting fever generally appears in an epidemic form, other cases proven to be malarious will aid in making the diagnosis exceedingly probable, if not clear.

Not only does it resemble typhoid and accidental fevers, but also the symptomatic fevers—inflammatory, hectic, and pyæmic. It is to be distinguished from the first by the common absence, at the early stage, of signs of local inflammation and by the remissions; from hectic, by there being no chronic inflammation, suppuration, or tuberculous degeneration, by the more equal distribution of heat over the surface, and by the absence of the peculiar disagreeable night sweats which occur in hectic.

It is to be distinguished from pyæmic fever by the presence in the latter of local disease or injury, by the more frequent repetition of chills, and more free sweats, etc., and by the less controllable character of the symptoms. But in the advanced stages of malarial fever, when local inflammations have occurred, and when the blood and tissues are poisoned by retained effete matters as well as by the malarial poison, the resemblance to typhoid fever, or to severe cases of primary inflammation, is so striking, as possibly to defy diagnosis in the absence of a full history of the case. For such history, therefore, we must carefully inquire.

Prognosis.—The Prognosis is dependent upon the treatment. Left to itself, many cases would result unfavorably, especially in localities nearer the equator. The *Jungle* and *Coast Fever* of Africa, the Jungle Fever of the East Indies, the *Panama Fever* of Central America, the Roman Fever, and others, are not unfrequently fatal, even with the treatment they receive. As it occurs in the northwestern portion of the United States of America it is usually severe, protracted, and not unfrequently fatal, without proper treatment; but with prompt and efficient treatment, the prognosis is very favorable. Nearly all cases not only certainly but speedily recover. At least the progress of the disease can almost always be arrested. Recurrences not unfrequently follow; and, from repeated attacks, decided impairment of various organs and functions may result; but as a rule, permanently serious consequences may be averted. When the disease has been permitted to become protracted, convalescence is often slow and imperfect, organic changes of the liver, the spleen, and other organs having taken place, which may require much time for their removal. In all such cases, more or less lowering of vitality is a consequence.

TREATMENT OF REMITTING FEVER.

As remitting fever depends upon the same essential cause as the intermitting variety, and presents many similar symptoms, the general principles of treatment applicable to the one are also applicable to the other. There are, however, differences in the phenomena of the two varieties, and modifications as to details, which, in a disease so severe as that now under consideration, require pointing out.

The first logical indication is to apply the antidote to the poison which is the cause of all the symptoms; and if the patient be seen, and the diagnosis made, before material local derangements have taken place, or effete matters have accumulated, and while the stomach is in a condition to readily absorb the medicine, the antimalarial remedy may be given at once in free apyretic doses. Quinine, in the quantity of one or two scruples (the latter quantity in severe cases will be safest), given in from two to five doses, all within a few hours, will generally put an end to the case, and prevent all marked subsequent symptoms. If the tongue should become coated, the skin and conjunctivæ icterode, or the bowels constipated, a blue pill or two, followed by an unirritating cathartic—a saline is generally best—will often complete the cure, and render any further medication unnecessary.

If, however, the liver or kidneys should still remain inactive, some further cholagogues and laxatives, or diuretics (acetate of potash in fl. ext. taraxicum, etc.) will be useful.

If, from the depressing influence of the poison, or the great severity of the symptoms (the case approaching the pernicious variety), there be decided and immediate danger, the *quinine should not be delayed*, whatever special conditions may be present. A decided and prompt impression should be made, and remedies for the local derangements, and for eliminating the effete matters, should be given afterward. Quinine may here be given hypodermically with advantage, provided a clear solution sufficiently concentrated can be obtained.

As patients are generally seen after the tongue has become coated, the secretions deranged, the liver, spleen, and other abdominal organs congested and irritated, and the portal circulation obstructed with all its consequences, palliative and "preparatory" treatment here, as in ague, is, as a rule, best. Though the antidotal treatment is indicated, and should be resorted to the moment it can be done to best advantage, yet that moment is not generally the one in which the patient is first seen, and other indications may first be fulfilled. The main indication, however, should always be kept in mind.

The cold stage, as it is seldom marked or severe, requires no particular attention in ordinary cases. Should it in exceptional cases require palliation, the same means that were recommended in ague should be resorted to.

The palliative measures for the pyrexia will, in the main, be the same as those advised in the hot stage of ague. The same bathing—sponging or packing with cold or tepid water—the same cold to the head, with cold and cooling drinks—the same effervescing mixtures, and, after evacuations, the same doses of morphine, when the stomach is irritable and the distress excessive. In plethoric patients with severe internal congestions, the same revulsive and depleting remedies, cuppings, leechings, ligation of extremities, or venesection will be required. Should the choleraic symptoms—the vomiting and purging of serous fluid—occur (and this is more likely in remitting than in the intermitting variety of these fevers), the same doses of morphine put upon the tongue, or of opium, camphor, and calomel, rubbed up with sugar into an impalpable powder, and given in the same small quantity of water, with but little drink afterward until the stomach is quieted, when more free drinking must be allowed to make up for the fluid which has been lost, will be demanded. As there is more likely to be severe and persistent irritation and inflammation of the stomach and other abdominal organs in remitting than in intermitting cases, in addition to the means mentioned, counter-irritation over the stomach is often required. A vesicant of cantharides produces a more permanent effect in allaying such irritation, but where a more immediate and temporary effect is required, sinapisms, ammonia, or a mixture of aqua ammonia and spirits of camphor, applied upon a cloth, and the vapor retained by some impervious material, will produce very active counter-irritation and speedy vesication. Repeated doses of morphine may be required, and this is certain to enter the blood and produce its effects when given hypodermically.

But the remedies more particularly "preparatory" to the anti-malarial specifics are the eliminatives—especially the cholagogue cathartics. Some advise the use of emetics, and when the stomach is evidently loaded with undigested food or other irritating material, and when from this cause there is gastric distress without the ability to vomit, drinking freely of warm water to induce emesis will be well. In exceptional cases a mild emetic may be proper; but the pain and the nausea are more frequently from irritation, congestion, or acute gastric catarrh; very frequently from decided inflammation, rather than from a loaded state of the stomach, and an emetic in such a condition could hardly fail to increase rather than relieve the irritation. Even when no signs of inflammation are present, an emetic not unfrequently produces a decided gastritis in the congested and irritable state so commonly present in remittent fever. As a rule, emetics should be avoided, as tending to produce both inflammation and prostration. The irritability and tendency to inflammation of the whole gastro-intestinal membrane, render the administration of drastic or irritating cathartics exceedingly objectionable. Gamboge, scammony, podophyllin, tartarized antimony, and the whole list of drastic and irritating articles must be most scrupulously avoided. A gentle mercurial, modified if necessary by moderate doses of morphine, and followed by a mild but sufficient dose of a simple saline cathartic, will not only not increase the local irritation, but by inducing free watery discharges of serous fluid from the mucous membrane, will unload the capillaries and the general portal vessels, relieve congestion, and produce a revulsive effect from the brain, besides eliminating effete matter from the blood and the whole system. They thus palliate the present condition and prepare the stomach for the more ready absorption, and the system for the more efficient action, of the quinine. By the use of these means, often combining or alternating with them diaphoretics and diuretics, the severity of the fever is abated, more decided remissions are likely to be obtained, sometimes intermissions are induced, and then free doses of quinine given in the manner already repeatedly described, will produce a speedy interruption of the fever. If the stomach remains irritable and the remissions are imperfect, morphine should be given with the quinine, sometimes in very decided doses; but the quinine must be no longer withheld, even if the fever is continuous. The more favorable time for its administration and its antimalarial effect is when the fever is less or least; but an abatement of the fever is by no means essential to its success; and when given in antipyretic doses it will produce the abatement of the fever, which favors its more complete antimalarial effect. The recommendation of nearly all the less recent writers to wait for an intermission, or for the fever to so far abate that a free perspiration is induced, before resorting to the quinine, is certainly wrong. Such abatement may not occur, and the case may go on from bad to worse; and at best the cure will be very much and very unnecessarily delayed by following such advice. It should not be forgotten that quinine is itself an antipyretic when given in free doses, and in these free doses it induces the intermission so earnestly desired. It indeed induces a condition of apyrexia which becomes permanent; and the more certainly and effectually when the influence of morphine is obtained at the same time. This may seem inconsistent with the statement that in intermittents the best time for administering the antiperiodic is during the intermission; but the inconsistency is only seeming, not real. Both statements are true. The quinine is more readily absorbed, produces its effects more certainly and in less quantity when given during an intermission or a marked remission; but the spontaneous occurrence of such intermission is not essential to its antimalarial effect, and in sufficiently free doses its immediate apyrexic effect is in harmony with, and aids its antimalarial operation. The statement substantially borrowed from another may here be repeated, that all the pathological conditions in malarial fever are by quinine simultaneously destroyed as by some central power.

When, without proper treatment, an advanced stage of the disease has occurred, and the complications described are present, palliative measures should not be neglected, but the quinine must be given soon and in the free quantities indicated. This is the essential remedy. It should be combined with opiates when the stomach and bowels are irritable, and if rejected, or if it produces local distress of these organs, it may be given by enema, or, better still, hypodermically. A proper attention to diet and regimen will be required, as in other fevers; and eliminatives, laxatives, cholagogues, diaphoretics, diuretics, and counter-irritation, or stimulants and supporting measures, may be demanded as particular conditions prevail.

This subject—treatment of remitting fever—is so important that repetitions may be justified if, by that means, a clearer or stronger impression can be made; and with this view a summary of the treatment of this fever is added.

The first logical indication is for the antidotal remedy, but others may precede in time. If called before local derangement or accumulation of effete matters occurs, we may give the antimalarial remedy at once. Or if there is great and immediate danger from severe symptoms, it should not be delayed. Make a decided and prompt impression with the quinine, and correct local derangements, and eliminate afterward.

As patients generally are seen, "preparatory" treatment is best. Mitigate local congestions and inflammations, *especially* correct derangement of the secretions, and modify the conditions of the stomach, as thereby the specific treatment is most sure.

Preparatory means are: moderate doses of mercurials, followed in a few hours by *saline* cathartics, repeated once or twice possibly; anodynes, sedatives, counter-irritants, revulsives, and, in plethoric patients, possibly bleeding, local and general. Immediate relief of symptoms of excitement is certain, but venesection is seldom required and may do ultimate harm by causing anæmia and debility. Other means will usually suffice, but occasionally bleeding is demanded. By relieving congestion the general vigor may be increased, and the oppressed pulse made more full and free.

Bleeding is not so well borne in hot climates, and it should be used with great care in *depression* from congestion of the brain. Cold to the head, affusions, free dry cupping, or ligation of extremities are safer, and a skillful use of the bath is often required.

Mercurial and saline cathartics are depurative, depleting, revulsive, and preparatory for specific treatment. Diaphoretics and diuretics are often useful. Effervescing mixtures, bitartrate of potash three parts to bicarbonate of soda one part, in the proportion of ʒss to half a tumbler of water, are to be taken immediately after mixing, as a cooling drink. When there is great irritation, especially after proper evacuations, morphine is not only relieving, but is permanently useful.

Irritating emetics and cathartics do harm. Emetics of any kind are very seldom well borne.

Cold water, internally and externally, often affords the greatest relief.

These palliative and preparatory means may be continued as required, but only for a few days at most (often only a few hours) before the *antidotal* remedy is used.

Do not *wait*, as was formerly taught, *for an intermission;* though if it come soon it is better.

Give the quinine early. It is absorbed best, and is more active in arresting the disease, if given during the remission. But it is not necessary to wait for even this. In severe cases give at once after a cathartic has operated. We may combine it with diaphoretics and diuretics. If there is much irritation add morphine, and sometimes other sedatives. Give a full antiperiodic quantity of quinine, more rather than less, if the fever is greater. Give from twenty to thirty-five grains in divided doses in a few hours, and *then stop.*

By these means the fever will be broken, except in very rare cases. Dr. Livingstone, in Africa, in remitting as well as intermitting fevers, gave a mercurial cathartic, and after its operation gave ten grains of quinine once in from two to four hours, until three doses, or half a drachm, was administered. When this was retained the arrest of the fever was effected.

If severe vomiting or retching occurs, the stomach may be washed out by giving freely of warm water, and then give a quarter of a grain of morphine, dropped dry on the root of the tongue, or in effervescing mixture, or hypodermically.

Continue eliminatives if required, and palliate such symptoms as remain.

At any time meet accidental complications. For hiccough, cups over stomach, chloroform, morphine, or camphor internally are proper remedies.

If convulsions in children occur, arrest with chloroform or ether. Evacuate the bowels generally, and prevent the paroxysm of fever by quinine promptly and freely administered.

Buzzing in the ears, deafness, etc., must not prevent the full quantity of quinine being given. These symptoms are no measure of its antimalarial power, and are of little consequence.

In the premonitory stage, a free antimalarial quantity of quinine will prevent the development if given in time, and more surely if preceded by a cathartic.

In all forms of malarial fever a full antimalarial quantity of quinine or its equivalent must be given during one intermission or remission, or within a few hours.

This is essential to the best success.

It will be observed that in malarial diseases and in many other derangements of the stomach and intestines and their accessory glands, moderate and occasional doses of blue mass or gray powder, to be followed by saline laxatives or cathartics, are here frequently advised.

Whether this be right or wrong, it is not done as a matter of unthinking routine, and without considering the dangers of excessive mercurialization, or the claims of other agents which some think may answer as a substitute for this important remedy. This course is advised so often, because my experience and the experience of others have taught me that this moderate and continuous use of the mercurials is *safe* in the cases where it is recommended, and is best for the interests of the patient. Whatever be considered its mode of action, there is great uniformity of opinion among practical men as to its beneficial effects in a great number of cases where there is derangement of the secretions of the digestive organs, and its superiority over all other remedies in numerous cases. Podophyllin, irisin, leptandrin, euonymin, and a variety of other articles, vegetable and mineral, new and old, are useful in modifying secretions, and accomplishing many of the objects sought to be attained by the use of the mercury; but none of them accomplish quite the same object. They either do not produce their effects so speedily, or their operations are accompanied by other undesirable consequences.

Podophyllin is slow in its action, and generally drastic and irritating when given in quantities sufficient to produce sensible effects; and much the same may be said of irisin and leptandrin. The euonymin has not been sufficiently used, especially in acute diseases, to establish a well-founded reputation; and the ordinary cathartics, including the exceedingly useful salines, fail to accomplish by themselves the results experienced from the additional use of the mercurials.

They are not absolutely essential to success in the treatment of the malarial fevers, but I believe them to be necessary to the *best* success.

I do not regret the caution, certainly, or even the timidity, which exists as to the use of this remedy. They tend to prevent excesses and accidents. It is better not to use mercurials at all than to use them excessively and recklessly. This, however, is the case with any powerful agent. But used with caution and moderation, mercury has a rôle which no other article can fully take.

PERNICIOUS MALARIAL FEVERS—CONGESTIVE CHILLS.

The term *Pernicious* has been applied to a variety of malarial fevers of an unusually severe, congestive, or collapsing form, proving fatal sometimes in the first, and never going beyond the fourth or fifth paroxysm, when unchecked. Without treatment it is among the most fatal of all diseases.

The cause of this fatality is either the profound congestions of internal organs—more frequently of the brain—or the immediate depressing effect of the poison, so affecting the circulation and other functions as to cause collapse. We thus have the two forms of congestive and collapsing pernicious fever. When the first paroxysm is survived, there is a decided tendency to an intermission; and the great improvement in the symptoms which occurs is likely to lead one not acquainted with this form of the disease to a false security. Without treatment, each succeeding paroxysm is more severe until the fatal result. Whenever, therefore, the characteristic symptoms appear, the most prompt treatment is demanded.

These symptoms will vary as one or other of the internal organs is most affected, and also according to the manner and degree of their affection. In the congestive variety, the brain is a frequent seat of the greatest local lesion; and the symptoms will often strikingly resemble those of apoplexy.

The patient, usually attacked in the fore part of the day, becomes somewhat chilly, and has the sensation of an approaching paroxysm of common ague. Instead, however, of the usual phenomena developing in the usual order, he becomes sleepy, stupid, and obtuse in sensibility and consciousness, and soon passes into a state of more or less profound coma. In this condition the temperature varies; that of the internal parts of the body is perhaps invariably elevated, and in a majority of cases the external temperature is moderately increased also; but the cutaneous circulation is sluggish, the skin has generally a purplish hue, and the head is hot, though the extremities may be cool. The pulse varies, but generally it is rather oppressed than free and full, and sometimes it is feeble at the wrist. The respiration is generally slow, labored, and often snoring; and sometimes moderate tetanic spasms occur. There may be such complete suspension of brain function that death occurs within a few hours. Otherwise, in from six to twelve, eighteen, or twenty-four hours the skin relaxes, and there is often a slight moisture of the surface, the patient gradually regains consciousness, and though feeling weak and often confused, he may be able to sit up and take food, etc. The type may be either quotidian or tertian, and this can be foretold only when there have been preceding aguish symptoms occurring at periods which have revealed the type. Without treatment another paroxysm is sure to come, and to be more severe than the first, but with similar symptoms.

When the congestive condition is chiefly in the abdominal organs, pain, depression, sometimes vomiting and purging, feeble pulse, cold extremities, and rapid exhaustion follow ; but the consciousness is not lost, and the mind may be clear.

When the lungs are specially congested, the respiration is labored and rapid, and its results imperfect ; the lips and surface are blue or leaden ; the pulse is oppressed ; an occasional cough, sometimes pulmonary hemorrhage, and depression and sinking follow. In other cases various internal organs are at the same time congested, varying the particular symptoms, but in all the greatest depression supervenes.

In the collapsing variety, without symptoms of special congestions, the various functions fail—the heart and vascular system particularly—the pulse becomes very feeble, and at length ceases at the wrist ; the extremities and the whole body become cold ; there is sometimes cold perspiration, and often complete collapse and speedy death.

Though distinctions of this kind may be made in accordance with the different phenomena presenting themselves, yet back of these phenomena, and producing them, is the malarial poison, operating upon and through the organic nervous system, and producing in all the cases more or less congestion and depression at the same time.

Dr. Dickson speaks of a necræmic variety, where death and disorganization of the blood corpuscles take place, and where there is persistent depression and inevitable somatic death.

Prof. N. S. Davis, of Chicago, makes five clinical varieties—comatose, spasmodic, pulmonary, choleraic, and algid. The phenomena which these terms indicate are embraced in the description given.

According as one or the other of the three organs more immediately essential to life is most affected, death may occur by coma, asthenia, and more rarely by apnœa.

On *post-mortem* examination, congestions of the brain, spleen, liver, stomach, intestines, heart, and lungs, one or more, are often discovered, and the blood in some cases has been found disorganized.

Diagnosis.—As the symptoms resemble those of other conditions, a careful inquiry into the history of the case, the influences to which the patient has been exposed, and the prevailing diseases at the time will be important in making the diagnosis.

A case is remembered where the attending physician failed to distinguish the true nature of the disease, but where the diagnosis was made clear by learning, though too late, that the patient some time before had been in Central America, and had there been affected with Panama fever. It should be particularly distinguished from apoplexy, cerebro-spinal meningitis, and narcotic poisoning.

It is much more frequent in the localities where the malarial poison is most intense, and in low latitudes, where the severer remitting forms of malarial fever are more prevalent, but it occasionally occurs in localities where ordinary ague most prevails.

TREATMENT OF PERNICIOUS MALARIAL FEVER.

The leading indication here, as in other malarial fevers, is to neutralize the poison which is the cause of all the phenomena; but the congestion must also be relieved and the rapidly failing vital powers sustained.

Here the case is so urgent there should be no delay in attempting to fulfill the first indication. Quinine, in large, prompt, and repeated doses, should be given at once, and as there may be doubt as to its absorption from the stomach, it may be given at the same time by enema, and for its more certain and speedy introduction into the blood, by *hypodermic injections.* Used in this latter way there must be a perfectly clear solution, and as this is not easily effected without a considerable quantity of fluid, injections may take place at several points at nearly the same time. From half a drachm to a drachm or more of quinine should be introduced into the system as soon as possible, and in the meantime measures should be used to fulfill the other obvious indications. For congestion of the brain, cold may be applied to the head, heat to the extremities, dry cups to different parts of the body; or the limbs may be ligated, and sinapisms applied to the extremities and along the spine. Moist heat, as by bottles of hot water surrounded by wet cloths if the surface is dry, or by the bottles without the wet cloths if there is much perspiration, may be useful. The bowels should, if loaded, be opened by enemas, the head elevated, and every restraint to the return of the circulation removed. Similar revulsive, derivative,' or "balancive" agents for other congestions, cups and sinapisms over the abdomen in congestion of its viscera, will be required. For the shock and depression stimulants should be used, such as hot coffee, ammonia, warm beef-tea well salted and spiced, camphor, ether, and sometimes hot alcohol and water. Whatever of these agents be selected, they should be given in moderate and repeated doses, but with care and discrimination, remembering that the narcotics, such as alcohol, ether, and camphor, may depress and overcome vital action when given in too large doses.

Prof. Davis advises that the patient be stripped and several gallons of cold water be dashed over the head and trunk, and then that he be quickly rolled up in dry flannel blankets for thirty minutes. If this is not followed by decided improvement, he advises its repetition, and if necessary, at the same intervals, for three or four times. This is claimed as theoretically correct, and to have the indorsement of clinical experience. Dr. Davis has used it successfully in two cases.

Under some circumstances the sudden application of cold arouses the system, and is followed by increased functional activity; but the first effect is usually regarded as depressing, and a considerable degree of vital energy must be present to justify this course; and where it would be successful the other measures advised would probably be equally so. These other measures have the sanction of very much larger experience.

When the vital actions are nearly overcome, and life is flickering on the verge of extinction, it would require some boldness to apply an agent which is generally held to produce at least temporary depression.

In these desperate cases great promptness and energy of treatment are essential. The patient, if possible, should not be left by the physician except in the hands of the most intelligent, energetic, and experienced persons, until the critical period is past.

However important other agents may be as aids, nothing will ultimately avail but full quantities of antidotal remedies, and none are equal to quinine in an emergency of this kind.

A drachm, more or less, must be given in divided doses; and here, as well as elsewhere, when vomiting, purging, or great irritation of the alimentary canal occurs, opiates may be combined with the quinine.

Although the prognosis is so exceedingly unfavorable without treatment, the means pointed out, promptly and skillfully used, will generally succeed if not commenced too late. Here, as well as elsewhere, the antidotal action of the quinine is more certain when given during abatement of the symptoms; but unless such abatement is certain, and this can very seldom be determined beforehand, it should not be waited for. The antidotal effect of the quinine must be secured as soon as possible, as the only safety.

MALARIAL CACHEXIA.

Cachectic conditions have already been mentioned as the result of long-continued malarial fevers. A condition of anæmia produced by

As the distinct disease we are now to consider, Typhoid Fever may be defined as a specific fever produced by a peculiar poison usually found in connection with putrefying organic substances, particularly fecal matters in privies and sewers; the poison being conveyed to the system sometimes by means of water and other ingesta, and sometimes through the air. This poison has a period of incubation, in which there is probably multiplication of its amount, and possible changes in its quality; and it produces phenomena of various kinds, but essentially those of a fever, which usually comes on gradually with languor, *malaise*, feebleness, moderate chills, headache, and general pains, especially in the abdomen, back, and limbs, with a tendency to diarrhœa, and soon to tympanitis, tenderness and gurgling on pressure in the right iliac region. As the disease advances, in the early part of the second week, a characteristic slight rose-colored eruption generally appears, showing itself first and chiefly on the abdomen, coming in successive crops, each small spot being visible about three days; there is often slight epistaxis; more or less ringing in the ears, and deafness; the face is often purplish and irregularly flushed; the tongue coated and sometimes dry, and, not unfrequently, toward the latter stages, red and glazed; there is more or less restlessness, but sometimes somnolence; frequently mild delirium, especially in a half-sleeping condition; there is commonly a slight stuffy cough, which will be developed by a full inspiration, with dryness of the throat and thirst not satisfactorily allayed by drinking. These symptoms commonly come on and disappear gradually, continuing about three weeks, the case terminating in recovery in five or six weeks. Anatomically, typhoid or enteric fever may be defined as an inflammation, infiltration, and often ulceration of the intestinal glands, chiefly of Peyer's patches in the lower part of the ilium, but often involving the solitary glands, and sometimes other tissues of the mucous membrane in the colon, and very rarely in the jejunum, as well as in the ilium. The mesentery and mesenteric glands, corresponding with the portion of the intestines affected, are also inflamed and infiltrated, and the spleen is enlarged, infiltrated, and softened; and probably other blood glands are essentially more or less affected.

There is so much in common between typhoid, typhus, relapsing, and accidental fevers, that they were formerly all called common continued fever, and the terms cynocha, cynochus, adynamic, ataxic, nervous, bilious, mucous, putrid, malignant, etc., were used as designating different varieties of the common fever, according to the peculiar views of each writer.

The distinction between typhus and typhoid was first made by

Prost, of France, in 1804, and more clearly, so far as the distinctive anatomical lesions are concerned, by Petit and Serres, in 1812; and their researches were followed up by other French physicians, particularly *Louis*, in 1829, and Andral and Chomel, Bretonneau and Forget afterward; and by Drs. Nathan Smith, James Jackson, Gerard, and Bartlett, of this country; by Cramer, Diett, Thielman, and others in Germany; and, finally, by Jenner, Murchison, and numerous others in Great Britain; so that the doctrine is now established, beyond any serious controversy, that these two fevers, typhoid and typhus, are different in their origin, their specific cause, their course, their pathological anatomy, and their essential nature, and must be regarded as distinct diseases.

The descriptive definition of typhoid fever already given, though presenting an outline of the most characteristic phenomena, would give a very imperfect impression of the disease without further details.

The mode of attack and early symptoms present great varieties. Generally the invasion is gradual and its early course insidious, but in exceptional cases it is sudden and violent, and scarcely distinguishable from an attack of typhus, or malarial, or severe accidental fever. During the early period, in variable degrees, there will be irregular chills and flushes of heat, lassitude, and aching of limbs, increased frequency of pulse, and elevation of temperature, thirst and loss of appetite, with coating or redness of the tongue, with pain or a decided feeling of heaviness in the head, with drowsiness by day, and a dreamy, restless, half wakefulness by night, sometimes vomiting and often diarrhœa, or at least a sensitive condition of the bowels, which would cause a laxative to operate with unusual freedom, accompanied often with pain and abdominal tenderness in the cæcal region; and though these last symptoms are not unfrequently absent at first, when present they are strongly indicative of the disease. During the first few days, and even the first week, and sometimes in a case which will ultimately become severe, the patient may not be confined to his bed, and although the symptoms gradually increase in severity and number, he may occasionally continue to attend to his ordinary business. By about the beginning of the second week, however, unless the case be exceptional, the symptoms become more fully developed and characteristic. The skin is now decidedly hot and usually dry, but sometimes a sweat breaks out that soon dries up again; the pulse is increased in frequency; the respiration is also accelerated, and the bronchial membrane is so much congested and irritated as often to produce a moderate or occasional cough. The tongue may continue comparatively clean and moist, there being only a thin whitish coat upon it, or it may be more heavily coated, red at the edges, and more inclined to be dry, and sometimes to present transverse cracks in the coating upon the dorsum. The throat is often so dry or sore as to make the voice husky and indistinct, and there may be frequent but unsuccessful efforts at clearing it from adherent mucus. The thirst is more decided; appetite usually nearly or quite lost; tympanitis occurs; the diarrhœa is generally though not always present, but when so the discharges are usually liquid or at least semi-fluid, and present the appearance of "pea soup" or "new cider," or have a muddy, yellowish aspect. Notwithstanding the frequent discharges, the tympanitis continues, and is sometimes greatest when there is most diarrhœa; and the distention being chiefly of the colon, the abdomen presents a "tub-shaped" rather than a "pot-shaped" appearance, as would be the case were the small intestines chiefly inflated. Delirium seldom occurs in the early stages of the fever unless there are brain complications, and by no means always at the fully developed stage, though disease of the brain supervenes before the termination of the case; but during the second and third weeks a mild delirium is very commonly present when the patient is left to himself or is in the semi-waking state. He generally answers intelligently, however, when fully aroused and addressed, but soon falls back into a wandering state, with strange and grotesque fancies. During this second week the eruption appears in about three quarters of the cases, while it is entirely absent in the other fourth. These eruptive spots are very small, about the size of a head of a pin, are rose-red in color, slightly raised in the centre, of a lenticular form, disappear on pressure, but soon reappear again when the finger is removed; are upon the anterior aspect of the body, and mostly upon the abdomen; are often few in number, and might readily escape notice unless searched for. At other times, however, they are more numerous and more conspicuous, extending over the body. They appear in succession, each continuing from two to four days—on an average three days—and they may be found in all stages at the same time: the stage of first appearance, of continuance, and of decline. Though generally they chiefly consist of enlargement of small vessels, and are lenticular, presenting the rounded form of segments of spheres, yet sometimes an effusion takes place at the centre, and they are then more or less acuminated. These special features of the eruption are to be carefully observed, as, when they are distinctly marked, they are characteristic of typhoid fever, distinguishing it from all other affections. The slight nasal hemorrhages may occur at any time after the development of the disease; and the dullness of hearing, so frequent a symptom, usually continues until the subsidence of the fever.

The temperature is an important element in the phenomena of typhoid fever, in reference to diagnosis, prognosis, and treatment. It is subject to variation in the rapidity of development and the height to which it rises; but in a typical case it is about as follows :

Day.	Morning.	Evening.
1	98.6°	100.8°
2	99.4°	101.4°
3	100.4°	102.6°
4	101.6°	104.0°
5	103.5°	104.4°
6	103.6°	104.6°
7	103.6°	104.6°

After this the temperature in the morning and evening varies about one degree, or a little more, throughout most of the normal course of an uncomplicated case ; varying, however, more toward the close. The frequency of the pulse does not always correspond with the height of the temperature, and it is often much varied from time to time by exertion or external influences. It may vary from twenty to thirty beats in a minute by the patient's simply rising up. If very fast or if extremely slow, as exceptionally occurs, the case is more severe. The higher and more continuous the temperature, the severer the disease.

From the condition thus sketched, not far from the end of the second week, the patient may begin to improve and gradually recover. But in a large proportion of cases the patient either continues much the same for another week or more, or he becomes weaker and worse, and often passes toward, the end of the second week, into a more decidedly *typhous* condition. The elevation of temperature is maintained, and possibly increases ; the rash continues to come out ; the tympanitis becomes greater ; the diarrhœa persists ; the tongue becomes dryer and harder ; it is protruded with difficulty and in a trembling manner, is often fissured, sometimes glossy and red, at other times covered with a thick brown or nearly black coat ; sordes collect upon the teeth ; delirium, stupor, or wakefulness, or what is called "coma-vigil" is present ; the pulse is more rapid and more feeble, the general prostration increases ; complaints of headaches or other pains cease ; the delirium becomes more constant and more profound, it may be muttering, busy, or violent ; sometimes the patient declares himself well, and insists upon leaving his bed ; blood may be passed by stool, sometimes in small, and at other times in larger quantity, and tympanitis may become so great as to interfere with respiration by pressure upon the diaphragm. The patient may remain in this condition for a week or more, when the symptoms gradually abate; the fever becomes less, perspiration breaks out, sleep is more quiet; the mind becomes more clear; the tongue grows moist; the diarrhœa diminishes; the appetite returns, the deafness disappears, and finally convalescence is established. In other cases matters will go on unfavorably. Tremors, subsultus tendinum, involuntary discharges, coma, failure of the heart's action, and death ensue.

In the milder cases, and when recovery is early, convalescence is often comparatively rapid, and is complete. Even in the more decided cases, the patient in a very few weeks may regain his strength and more than his usual flesh, and may feel a keen sense of renewed life. The hair, in all the well-marked cases, is likely to fall out some time later; but it is soon restored, and the patient returns to his usual condition. In other severe cases the convalescence is slow and imperfect; the mind, in rare instances, for a time may be left almost a blank; in other cases the bowels may be irregular—alternations of diarrhœa and constipation; tenderness and pain in the abdomen, especially in the right iliac region, may persist; and, though the appetite may be sufficient, much food or irritating articles may cause great distress, and an enfeebled and deranged state may linger for a long time and become permanent. Sometimes, though rarely, when convalescence seems to be established, a relapse takes place, and many of the phenomena are repeated; but much more frequently, when severe symptoms occur during convalescence, the condition is that of some local disease continuing, and being aggravated by imprudence or some other cause.

The secretion of the kidneys, during the active stage of the disease, has the common characteristics of febrile urine. The quantity of urea and uric acid varies with the quantity of food taken, with the activity of the fever, the rapidity of the consumption of the tissues, and the activity of the kidneys' secreting function. The water of the urine is generally diminished, though not unfrequently it is augmented, while its specific gravity is at the same time increased by the larger amount of urea, uric acid, and salts, which it contains. The coloring matter is increased by the destruction of the blood corpuscles; and sometimes the urine contains moderate quantities of bile or albumen. The more urea and uric acid it contains, with a given amount of fever and food, the less of these ingredients and other effete matters will be retained in the blood, and the less blood poisoning from these sources will occur. Should the kidneys be diseased, so as to fail in their eliminative function, uræmic and uricæmic poisoning would follow.

As the disease abates, urea and uric acid are diminished, and the specific gravity of the urine becomes much less. In the favorable cases, when the specific fever poison has exhausted its power, the process of purification and repair is established; but the system often has a struggle to accomplish this object, and the temperature and other conditions may vacillate. While in the morning the temperature may be down to nearly, or quite, the normal, in the evening it may rise to 103° or 104°; but the next morning it will again be down, and so, with fluctuation, the fever will at length disappear.

The foregoing is intended as a description of the more important and ordinary symptoms of the common uncomplicated cases of typhoid fever; but there are many deviations from this type which require notice in order to a proper understanding of this very frequent and important disease.

Occasionally cases occur which are milder in character, and sometimes, though rarely, shorter in duration than the mildest already described. Not only does the patient not take his bed for the first week, but he may not take it at all. The temperature may not rise above 100°; the tongue may be but slightly coated; there may be but very little or no diarrhœa, and yet some tenderness in the ilio-cæcal region; languor and depression will be felt, the sleep will be dreamy and less refreshing, the appetite poor, etc.

This condition may continue for two weeks, more or less, when the patient resumes his former condition. Cases of this kind are often not recognized as typhoid fever, and they are now believed to be much more frequent than was formerly supposed. Mild cases not unfrequently occur in children, and many of the cases described as "infantile remittents" are now regarded as genuine typhoid.

Not only may such mild cases occur, running a gentle course, but *abortive* cases are not very unfrequent. In these the typhoid poison evidently enters the system and produces some effect—induces some of the premonitory symptoms, and perhaps a distinct access of the disease; but either the poison is expelled or the system resists its full and ordinary effects, and all symptoms soon disappear. Such patients are said to be "threatened" with the fever, but it ends in a practical threat. Sometimes what are called "walking" cases occur, where the general symptoms are mild, but where the intestinal lesion may be as great as in other cases, and where hemorrhage, rupture, peritonitis, or other grave symptoms may suddenly supervene.

But on the other hand, there are cases of unusual severity from the beginning, where the typhoid poison acts with the greatest promptness and violence, like a narcotico-acrid poison, producing speedy typhous symptoms—stupor, coma, and death. Such cases are very rare, but have been observed; and less rarely, instead of insidious attacks, sudden and active symptoms occur from the beginning, the temperature speedily rising to 105° or 106°; or more, but the disease progressing with the development of the usual, though perhaps more than usually severe, phenomena.

There are, besides, numerous variations from the more common type in the course of the disease.

Grisolle divides the progress of the disease into three stages or septenary periods, while Jaccoud makes two periods—that of the typhic process, or the period of the action of the poison, and that of the period of (at least attempted) repair. The stages, pathological or clinical, depend on changes occurring, and not on days; and changes are progressive, and varying in the time of their occurrence. The period of the poison's direct action is neither definite nor distinguishable from its more remote effects, or from the reactions of the system and the efforts at repair. There are therefore not sufficient grounds for designating definite stages, as there is a series of phenomena overlapping each other, and mingling in a continued process of pathological changes and symptomatic manifestations. These vary in number, in character, in degree, and in the time of occurrence and continuance, rendering it impossible to give a description which will be applicable to all cases, and requiring a statement of many details in giving a satisfactory account of this fever. The phenomena are, however, grouped in such a manner as to furnish certain varieties, having somewhat distinctive physiognomies, and admitting of a loose classification. Grisolle makes these principal varieties — inflammatory, bilious, mucous, adynamic, ataxic, and latent.

In what he calls the Inflammatory variety, there is much excitement, a high full pulse, intense heat, great thirst, skin injected, urine red and scanty, the phenomena resembling those of fever accompanying active inflammation, or some forms of simple fever or of the hot stage of malarial fevers. This condition, however, is temporary, lasting only about the first week, when the more typhoidal or adynamic symptoms supervene.

The Bilious variety is marked by a yellow coat of the tongue, a bitter taste in the mouth, and an icterode tint of the skin, and it prevails most in the latter part of summer and autumn. Like the preceding, it is merged, after a week or so, into a more adynamic form.

The Mucous form is oftener seen in feeble, badly fed persons, in unhealthy situations. The face is comparatively pale and puffy, the tongue white, mouth pasty, and stools often mucous. There is generally a catarrhal condition of the digestive mucous membrane.

Here, as in the other forms, the adynamic condition sooner or later occurs.

The distinctively Adynamic or Putrid form, is that which is most common in Paris and in many other large cities, and is also the form most commonly found in large hospitals. In Paris, it is said, one third of the cases are of this type primarily, and in nearly all the cases the adynamia occurs in the latter stages. In this variety there are great weakness and prostration, coma, feebleness, and sometimes slowness of the pulse; suppressed cutaneous circulation, and sometimes coldness of the extremities; fetid dejections, dark tongue, sordes, passive hemorrhages, and a low condition in the vitality of the blood.

The Ataxic, Nervous, or Cerebral variety, is marked by early delirium, perversion of the senses, subsultus tendinum, convulsions occasionally, cutaneous hyperæsthesia or anæsthesia; the spinal and cerebral symptoms are commingled and scarcely distinguishable.

But the different symptoms characterizing these varieties are mingled in different proportions in individual cases, so that it will often be almost impossible to say to which of these varieties a given case belongs, and, as already stated, both adynamic and ataxic symptoms commonly occur in the latter stages of all severe cases.

The Latent form of Grisolle corresponds with the very mild forms already described. Frequently the diagnosis is not made at all, but in some cases violent and characteristic symptoms or complications occur in a later stage from perforation of the intestines, hemorrhage, or peritonitis. The result is fatal, and a post-mortem examination will confirm the diagnosis indicated by these symptoms.

But, independent of these varieties, individual symptoms vary much in different cases.

The temperature, the most important symptom or element in most cases, varies often decidedly from the typical standard given. Sometimes the remissions are particularly marked, more so than in some of the varieties of malarial fever. Often the temperature increases about noon, and is at its height between 7 P.M. and midnight. After midnight it falls gradually, and attains its minimum in the morning. In uncomplicated cases these daily fluctuations are nearly constant, but vary from one to two or three, or rarely to even four degrees, in different cases. After about the end of the second week, in mild cases, the morning temperature may be very near the normal, the evening as high as before; but soon this too may decline, and the case, with fluctuations, goes on to convalescence. Some are of the opinion that the activity of the specific poison is normally not over about two weeks, and that the continuance of the symptoms after that time is due to the local lesions that have been induced, or to the degenerative processes in the general solid tissues, or the impurities and perversions of the fluids of the system.

In severe cases, after the end of the first week, the high temperature may be more constant and uniform than at the earlier period. In complications the thermal changes are various, and will be referred to in connection with the descriptions of such conditions. In the condition of collapse, however produced, the temperature generally falls, sometimes below the normal, but in other cases, before death, it sometimes rises to 108°; or even 110° or more, even independent of complications.

The pulse varies greatly in frequency. In occasional very mild cases it is scarcely above the normal at any time. In other cases, and according to their severity, it rises to 90, 100, 120, or 140 or more; and when very rapid it usually becomes feeble. It is generally more rapid in the evening than in the morning, and in the latter than in the earlier stage of the disease. Occasionally it is abnormally slow, and even when the temperature is high it may sink to 60 or 50; and Murchison mentions a case where it fell to 37 per minute. In one season, in Berkshire Co., Mass., in a particular locality, in several cases the frequency of pulsations was exceedingly low. In some severe cases, and rarely in cases not exceedingly severe, the pulse is *dicrotus;* that is, two waves are felt at each pulsation of the heart; and other irregularities as to time or rhythm are sometimes noticed. The respiration is generally increased in frequency, and in a degree corresponding with the frequency of the pulse. If increased out of proportion to the pulse, it would commonly indicate pulmonary or bronchial complications. Still, disturbances of innervation will sometimes vary the frequency of respiration in either direction. It may, with such disturbances, particularly in hysterical persons, become very fast or very slow for a time, independent of structural changes.

The appearance of the tongue varies not only with the period and severity of the fever, but independently of them. In some cases it remains almost normal throughout the illness, with only a slight whitish coat, or a little redness and dryness. More commonly it is covered, except at the margins, with a whitish brown fur, consisting of hyperplastic and adherent epithelium, with mingled mucus from the buccal membrane, which tends to become dry; or the tongue may have a dry, red, glazed appearance, without prominent epithelium, but with, or without, flakes of adherent mucus; and in either case, of coating or glazing, there may or may not be transverse fissures.

The throat is often irritated, congested, and dry, and sometimes, as a complication, inflamed, and even, rarely, ulcerated. These conditions often give the patient great discomfort, especially when dried and tenacious mucus persistently adheres to the posterior pharynx.

The condition of the stomach, and the capacity to bear food and medicines, will vary in different cases. Not unfrequently there is sickness, and sometimes vomiting, in the early stage of the fever, and occasionally this irritability continues throughout the disease; but usually, unless there is a complication of gastric inflammation, the sickness subsides after some days, and if food of a proper quality be administered in moderate quantities and at regular intervals, a tolerance if not an appetite is established, and the nutrition of the patient is thus more satisfactorily kept up. Thirst is nearly always present, but it varies much in intensity, and in rare instances drink is not particularly craved.

Diarrhœa, usually present, varies much in the frequency and copiousness of the discharges; and sometimes the bowels are even constipated. The diarrhœal evacuations vary in liquidity, but are usually of a greenish or yellowish color, generally decidedly offensive, sometimes fetid, and not unfrequently mingled with blood. Profuse hemorrhage from the bowels is one of the complications to be hereafter noticed.

The urine, as already mentioned, is febrile in character; in the early stage it is scanty, high colored, and of high specific gravity, but later it becomes more copious, paler, and of lower specific gravity; yet it varies in all these respects in different cases. A small quantity of albumen may be detected during the third week in perhaps a third of the cases, and the quantity of common salt is usually diminished throughout.

The skin, though commonly dry, is liable in many cases to become occasionally moist, and sometimes there is free sweating. In one local epidemic of great severity which I witnessed, profuse perspiration was a marked condition of most of the cases, continuing through the course of the disease, which was fatal in a larger proportion of cases than usual. Not unfrequently from the last of the second week perspiration may be free, especially in the morning. Insensible perspiration in all forms of fever is more free than is generally supposed. The elevated temperature effects a speedy evaporation of the exuded moisture, and causes dryness where exhalation is nevertheless considerable.

The eruption which has been described varies much in amount, and is not unfrequently absent; but it varies but little in character when present.

During convalescence perspiration is often profuse; and as the cuticle is altered and rendered less pervious, and perhaps looser, by the continued fever, it is generally elevated in points by the pouring out of the sweat, constituting *sudamina*, or sweat blisters. These are most likely to appear about the anterior part of the chest and neck.

The ringing in the ears and the dullness of hearing are very variable, and not unfrequently absent: so also with the slight bleeding from the nose; but sometimes profuse epistaxis occurs, requiring interference. In most nasal hemorrhages, seizing between the thumb and finger the cartilaginous part of the organ, as close as possible to the nasal bones, pressing steadily and firmly so as to bring the surfaces of the pituitary membrane in contact, and holding them thus for several minutes, will arrest the bleeding. If this is not successful, plugging the nostrils may be required.

The conjunctivæ are seldom congested, the pupils are commonly dilated, and the vision is not generally much impaired.

Delirium, when present, is variable in character and amount—generally mild, and occurring between sleeping and waking; it is sometimes profound, may be low and muttering, or more active and violent—and coma, subsultus tendinum, and convulsions in the ataxic varieties may occur.

Few diseases are more variable in some of their phenomena, and yet none are more constant in others; and no disease has more certainly a specific identity.

The different local complications that are liable to occur in typhoid fever will vary still more the symptoms and course of particular cases; but these can be better understood after describing the pathological changes occurring in the course of the disease.

PATHOLOGICAL ANATOMY.

As the disease usually terminates before a long period of wasting, the cadaver is not extremely emaciated. The *rigor mortis* is marked, and the muscles are often red, being infiltrated with the coloring matter of the blood. The fibrine, the albumen, and the red corpuscles are diminished, the blood discs are sometimes found broken down, while the proportion of the white globules is increased. Jaccoud speaks of typhoid leucocytes.

The oxidation of the blood appears to be below the normal standard, and the quantity of carbonic acid increased. The amount of sugar in the blood is also said to be above the normal, while some report that the urea in it is diminished. This poison is probably by no means uniform. Bacteria have been found in the blood, but whether these have a necessary connection with the disease has not been determined.

Of the lesions of organs, some are so constantly found as properly to be regarded as necessary to the disease; while others are found occasionally, and are so frequently absent as to be justly considered as accidental; but these latter, when present, have often a great influence upon the course and results of the disease.

The necessary specific lesions are congestion, swelling, deposits in, often ulceration, and sometimes sloughing of, Peyer's patches and the solitary glands, generally near the ilio-cæcal valve; and hyperæmia, inflammation, and sometimes suppuration of the corresponding mesenteric glands, and enlargement, softening, and deposits in the spleen. These changes, which require a more particular description, belong to typhoid fever, as the eruption does to measles or to small-pox. They may possibly be absent; but this is so rare as to constitute an abnormality of the proper conditions of the disease, and to make its genuineness doubtful. The lesions of the intestines probably commence with the earlier symptoms of the fever. They have, in a sufficient number of cases, been observed as early as the fifth day. From the fifth to the eighth day, the portion of the ilium, where Peyer's patches are involved, observed exteriorly, will present at the points affected a red, blue, or blackish color, impairing the transparency. In some cases a patch of false membrane has been observed upon the peritoneal surface, inflammation having extended to that membrane. This, however, is not common. Pressing the part between the thumb and finger, an inequality of thickness is felt, showing a tumefied condition of the glands. Examined from the internal surface, the swellings of the solitary glands are conical, rounded, and disseminated, and about the size of half a pea. Those of Peyer's patches are on the part of the intestine opposite to the mesentery, are of a larger circumference, and more oval or irregular in shape. They are from two to five centimetres in length, and one and a half to two or more in breadth. Their thickness varies much in different cases, from one to nine millimetres (from less than a line to one third of an inch). They present a more or less tumid margin, and a palish or pinkish white color.

Some of these patches are *soft*, and but slightly prominent, the surface foveated, or mammillated, or more smooth, and offering little resistance to pressure. When cut through, the mucous membrane of the intestine is found thickened, moist, and injected, presenting an appearance like the parenchyma of a cherry or a plum. The membrane over the swollen gland is softened and easily removed. Others of these patches are *hard*, more prominent, more shining in color, more elastic and firm to the touch, but friable. When cut through, they show a yellowish-white appearance; they involve the mucous membrane, which undergoes the same changes as in the soft variety. The hard plaques are found in about one third of the post-mortem examinations, and are regarded as more grave lesions than the soft.

The isolated follicles undergo the same changes. They differ only in being cone-shaped and smaller. The hard and soft swellings occur simultaneously, but unequally in different cases. Black points in the membrane are sometimes observed, looking like a newly-growing beard after shaving. These have been regarded by some as typhoid deposits; but they are found in other cases than in typhoid fever, and are perhaps only anatomical peculiarities.

The swellings of the glands attain their full development by the ninth or tenth day, sometimes a day or two earlier or later, when they may gradually subside; the hyperæmia diminishes, the exudates become absorbed, or, more frequently, the contents become discharged with a simple rupture of the membranous covering of the glands, and a slow restoration takes place. In other, and generally in the severer cases of the disease, and not unfrequently in those cases where the general symptoms are mild, instead of this resolution from the ninth to the twelfth day, when the swellings attain their maximum, and rarely sooner (one case having been seen on the sixth day of the disease), ulceration occurs.

This process commences in two ways. In one it begins at the margins of the swollen glands in the mucous membrane, extending to the diseased gland and gradually destroying it; in the other the softening commences in the gland, it breaks down, and the destructive process extends to the membrane. Necrosis of the gland sometimes occurs suddenly, and an eschar is formed of it before the mucous membrane is destroyed, and this for a time may hold the necrosed gland in place; but soon the membrane is ulcerated, and the diseased or dead gland is thrown off in larger masses or smaller shreds. These, by careful searching with glasses are sometimes detected in the stools, and when recognized become positive proofs of enteric fever.

Both of these modes of ulceration may occur at the same time; and the succeeding ulcerative process—the spread of the ulcers—may vary much in different cases. The ulcers at the seat of the agminated patches are generally oval but may be irregular. Those of the solitary glands are circular and generally limited, but sometimes extend farther. The margins of some of the ulcers are thick and salient like a collar; others are thin, presenting no prominences; some are adherent, others are loose and undermined. The bottoms of some are covered with a brownish, slaty, gray, or yellowish granular mass, in larger or smaller quantity; others are more clean and red, showing the muscular coat of the intestine thickened; while in other cases the ulcerative process extends to this coat, and destroying it leaves only the thin peritoneal coat, which itself may undergo the ulcerative process, or softened and weakened may rupture. When this is the case the intestinal contents pass more or less freely into the peritoneal cavity, causing great shock, violent peritonitis, and death. In some rare cases the eschar involves all the coats of the intestines, and perforation takes place at its falling off. In still other cases inflammation occurs at the seat of the ulcer on the external surface of the peritoneal coat, adhesions form to other intestines, or to some surrounding parts, preventing perforation; or such adhesions may be torn asunder by exertion or some physical cause, producing perforation in this way with its fatal consequences. A perforation may take place from a very small ulcer, and when there are few ulcers, they are, according to Grisolle, likely to penetrate deeper than when there are more. Penetration is quite as likely to occur in cases where disease of the intestinal glands is limited in extent, and where the symptoms are mild, as where the number involved is larger and the preceding symptoms are more grave. The size of the penetration in the peritoneal membrane varies. It may be very small, not more than a line or two in extent, and yet give exit to intestinal contents sufficient to produce the most disastrous results. If larger, a more profuse outflow is likely to occur, and a more profound shock and speedy death follow. Occasionally, though very rarely, there are recoveries after perforations have occurred. The ground of hope is in the formation of adhesions and the prevention of the passage of intestinal contents into the peritoneal cavity.

The number of diseased glands varies exceedingly in different cases. There may be a single patch, or thirty or forty patches—very few or many of the solitary glands. Though the chief seat is in the small intestine, and at the lower third of the ilium, yet the solitary glands in the cæcum and ascending colon are not unfrequently affected (in about one third of the fatal cases), and in rare cases the glands in the jejunum are the seat of similar changes. Very rarely the solitary glands are affected in the colon and elsewhere, while Peyer's patches escape, and errors may occur when the examination is not extended beyond the patches and the lower ilium. In a very large majority of cases, however, the patches of agminated glands nearest the valve are first and most generally affected, and not unfrequently are the exclusive seats of this peculiar intestinal lesion.

Recent investigations by Dr. Klein seem to show that the smaller typhoid growths do not originate exclusively in the glands, but may arise in the lymphoid tissue of the mucous membrane. The microscope shows that the process, both in the intestines and mesenteric glands, is not only accompanied with hyperæmia, but with increased development of lymphatic cells and of *giant cells* not unlike those found in tubercle; and also that there is rarefaction of the fibrous connective tissue. A microscopical fungus was also found in connection with these specific intestinal typhoid lesions. These fungi consisted of greenish spherical bodies, two or three times as large as the blood corpuscles; and micrococci, or spores of extreme minuteness, singly, in couples, or strings, or irregular clusters, were observed. These mycelial fungi were found on the surface of the mucous membrane and within the tubular glands, but they pervaded also the epithelium, and were especially abundant in the lymphatic spaces and channels, and in the small veins. They were also found in the diseased mesenteric glands. Observations of this kind have not been sufficient to establish a definite connection between these fungi and the disease; but the time may not be distant when the essential cause of this fever and these lesions will be conclusively shown to depend upon some microzyme or organic material, for which an antidote may be found.

After six to eight weeks the intestinal ulcers become thin and flattened, the bottoms of a slate gray, or covered with a pellicle smooth and shining like a serous membrane; the previous villosity being removed by the covering of the ulcerated surface, veritable cicatrices are formed and the ulcers are healed.

The patches of diseased glands which have not ulcerated are atrophied and depressed, are of a bluish gray or darker color, and tolerably consistent.

Both the hard and soft variety of swollen glands are capable of resolution, except in the reticulated form, when there is early destruction of tissue.

The mesenteric glands, as has already been stated, are almost always diseased when the intestines are affected, but they present different appearances at different stages of the fever. From the fifth to the fifteenth day they are found hyperæmic and swollen, as large as filberts, or sometimes larger, and are red, friable, and softened. From the fifteenth to the twentieth day they are still more swollen and injected, and not unfrequently, when cut across, pus is found infiltrated in small points; but there is very seldom any collection into an abscess. From the twentieth to the thirtieth day the swelling subsides, the glands becoming brownish, or of a violet color; and after thirty days they become gray, slate colored, and more consistent. Rarely they undergo a lardaceous degeneration.

The number of these glands affected corresponds with the extent of disease in the small intestines. In about three fourths of the cases the mesocolic glands are somewhat swollen, but are less severely affected than the mesenteric.

The remaining well-recognized essential lesion is of the spleen. From the fifth to the twentieth or twenty-fifth day this organ is found doubled, trebled, or quadrupled in size, of a dark wine color, friable and easily broken down into a pulpy mass. A similar condition, so far as the general appearance is concerned, is found in many fevers and some other diseases of debility; but, excepting in severe cases of malarial fever, it is nowhere so frequent or so marked as in typhoid fever. After thirty days its condition improves, though the patient dies later of the fever or its consequences; indicating that while the typhoid poison is present and active the spleen suffers, and after its direct effects are exhausted the spleen improves, whatever other conditions may exist. It may remain more dense, however, until the fortieth or fiftieth day. In rare cases the spleen may be so much enlarged and softened as to have its peritoneal capsule ruptured, a fatal hemorrhage taking place into the peritoneum.

According to Jaccoud, "typhic neoplastic" deposits, such as occur in the intestines, take place in the spleen and in other organs as well; and he avers that they are much more extensive than was formerly supposed. They are found in the "blood gland system" generally, and may have much to do in the production of the blood perversions which are important elements in the disease. These deposits are said to have been found in the stomach, in the general tissue of the intestines, in the liver, in the kidneys, and, in one case, in the coats of the bladder, as well as in the spleen, lymphatic glands, mesentery, etc.

Lesions of other organs than those that have been described are not regarded as specific, but are such as may occur in other diseases, and may or may not be present in this.

In fatal cases the pharynx and œsophagus are not unfrequently found inflamed, sometimes a false membrane is found upon the surface, and sometimes purulent infiltration is in the substance of the membrane and submucous tissue, and in other cases superficial ulcerations appear.

The stomach is found perceptibly diseased in a considerable proportion (about two thirds) of the fatal cases, sometimes when not indicated by any marked symptoms during life.

According to Grisolle, ulceration is present in one twelfth of the fatal cases; the mucous membrane is softened and thickened in one fifth or more, and there are congestion and discoloration in others. The mucous coat of the intestines between the diseased glands is sometimes found in a healthy condition, but in from three fifths to four fifths of the cases it is injected and softened, especially in those cases terminating within the first two weeks. When death occurs after twenty days, this membrane is not so much affected; but it is often gray or slaty looking in consequence of previous injection. There are some perceptible lesions in the large intestines in a majority of cases. In three fourths of the cases there is some degree of softening, with or without injection in the cæcum. In one fifth of the cases in Paris there are spots of abrasion or superficial ulcerations of the mucous membrane of the large intestines, but not always confined to the follicles. These ulcers are rarely cicatrized, even in protracted cases, indicating their development at a later stage of the fever.

Sanguineous infiltrations are sometimes found in different portions of the intestines in cases where hemorrhage has occurred not long before death; but these or similar appearances may be produced by imbibition of blood post mortem.

The liver is softened in half of the cases, and the bile is quite fluid. The function of this organ is generally decidedly changed; and besides being softened, it is sometimes fatty, granular, of a grayish red, or grayish yellow color, and rarely it is found broken down.

The lungs are found altered more or less in two thirds of the fatal cases. In a majority of the cases they are merely congested, but sometimes lobar or lobular pneumonia is present. The most common alteration, however, is what is called splenization—a subinflammatory affection in which there are passive hyperæmia and serous or sero-plastic effusions. The lung becomes of a violet color, is heavy, resistant, but more flabby than in hepatization; when incised there is a flow of sero-sanguineous fluid, and the general appearance of the part affected is much like that of the spleen. The posterior part of both lungs is the most frequent seat of this change. When pneumonia occurs, it is of rather a passive than active kind, more or less hypostatic—the exudate being less firm than in acute croupous pneumonitis—and it is not unfrequently lobular. Sometimes there is more hyperplasia of the pulmonary tissue than in ordinary splenization, presenting a condition of carnification. Very rarely abscess of the lung is formed; but not unfrequently there is œdema of these organs, which may come on suddenly and prove terminal.

Bronchial congestion is very frequent, and sometimes a decided bronchial catarrh is developed. Enlarged bronchial glands not unfrequently are found, and sometimes laryngeal and bronchial, as well as pharyngeal ulcerations are present. In occasional cases, tuberculous deposits occur during a protracted fever, developing soon into acute consumption, if the patient survives the fever. Occasionally, but more rarely, acute suppurative or sphacelating parotitis is found, and so are erysipelas, phlebitis, and infiltration of the heart and arteries. More frequently degeneration of the heart, liver, and spleen takes place, and sometimes of the brain and spinal cord.

The kidneys are sometimes softened, and suffer changes similar to the liver. These accidental changes, though probably influenced to some extent by the direct action of the typhoid poison, are thought by Juergensen to be chiefly dependent upon the degree and duration of the fever heat; and, according to this author, degeneration, produced by the fever heat, of the muscular tissue of the heart, causing asthenia, is among the most frequent causes of death.

From this enumeration of the pathological lesions the symptomatic complications can be readily understood.

We have seen that peritonitis would almost necessarily result from perforation of the intestine; and we can readily imagine the severe pain, the profound shock, and the rapid and extensive inflammation which would follow. We have also seen that inflammation of the peritoneal coats of the intestine may occur from the extension of the inflammation of the follicles and tissues around them, without perforation; and this inflammation may extend more or less over the membrane, causing pain, tenderness, depression, and other symptoms of peritonitis.

Another result of the ulceration is the opening of blood-vessels, and the occurrence of hemorrhage, which is sometimes profuse.

The changes in the stomach may lead to nausea, vomiting, pain and intolerance of food and medicines—those in the lungs to dyspnœa, pain, expectoration, increase of fever, depression, and the development of the physical signs of the particular conditions, etc.

Any material change in the brain or spinal cord will of course be followed by nervous perversions—and so of other changes.

The complication most to be dreaded is peritonitis. When resulting from perforation, which is most common, it is ushered in by severe pain, and often by a chill—the tympanitis is increased, the diarrhœa which had been present before may cease, the pulse becomes rapid and feeble, vomiting often occurs, and free quantities of a green or dark fluid may be ejected; respiration becomes rapid and labored, and when there is great depression the pain may cease, the patient becomes collapsed, and death occurs from asthenia. In some cases of perforation the shock is so profound, the depression so rapid, and anæsthesia so speedy and great, that no pain is expressed—the patient collapsing and speedily sinking. In such sudden prostrations, though no pain or other ordinary symptoms of peritonitis are present, perforation may be inferred, or at least should be suspected. Too much food, extensive tympanitis, pressure upon the abdomen, or sudden exertion may favor the rupture; but not unfrequently it occurs suddenly and unexpectedly, without any cause but the ulcerative process already described. It is an accident more frequently occurring in adolescents and adults than in children; and when it arises from perforation the patient seldom survives more than two days, and often succumbs much sooner.

The cases of peritonitis not dependent upon perforation are not as violent in their onset, or rapid in their progress; but similar symptoms present themselves, and a similar result, sooner or later, usually, though not always, follows. I have known one patient to survive even a perforation, but succumb to a subsequent one, some two or three weeks later, the post-mortem examination furnishing evidence of both accidents.

Hemorrhage from the bowels more frequently occurs during the second or third week, when the ulcerative process is most active, and opening of vessels by the ulceration is the most common cause, though sometimes it occurs from extreme hyperæmia by capillary oozing from other portions of the mucous membrane. In some cases there is an acute hemorrhagic diathesis revealed by repeated hemorrhages, not only from the bowels but from the nose, marked also by petechiæ on different parts of the surface. This is more dangerous than the accidental hemorrhages from the intestinal ulcerations and congestions. The loss of blood may be slight—it may be mingled with other intestinal matter, and be scarcely distinguishable. When more free it may pass off speedily and in a comparatively fresh condition; at other times it is retained longer and passes in the form of clots more or less firm; and in other cases still, it is mingled with fecal matter, and when retained for a length of time, becomes of a dark brown or black color, and may appear like dark coffee grounds settling in the bottom of the vessel. If profuse, it will be marked by pallor, diminution of temperature, lowering of the force of the pulse, and prostration of strength; and may be followed by syncope and death. If less profuse, but still decided, it may be followed by marked relief to the febrile symptoms, and by convalescence soon after; and the danger of protracted debility from excessive loss of blood, though very great, is often overrated by our modern fears. I have seen hemorrhage in typhoid fever fatal, but I have often seen it followed by relief. Even in the latter stages of a very severe and protracted case I have seen a comatose patient awaken, a tetanic arm relax, a hard, dry tongue become soft and moist, a temperature of 105° speedily brought down to the neighborhood of 100°, a dry skin bathed with gentle moisture, and convalescence, thus commencing, progress with quite the usual rapidity to a complete recovery, after a loss of blood, involuntarily passed from the bowels, that was reckoned by pints. Such an event may be regarded as a fortunate escape, as doubtless any considerably greater loss would have been fatal; and though nature happened to be successful, art would not be justified in so hazardous an imitation; yet such a fact, and this is not a solitary one, should diminish our horror of a loss of blood, and moderate our denunciation of the fathers for their use of blood-letting as a remedial agent. I can also state that I have seen an immense loss of blood from the bowels, in a vigorous and plethoric young woman, in the early stage of what was regarded by an eminent and experienced attending physician as a case of typhoid fever, followed by an astonishing improvement in all the symptoms, and an early and complete convalescence. The fact must be admitted that in various inflammations a loss of blood, especially if from or near the inflamed parts, often produces the most marked relief, and is attended with less debilitating effects than many suppose. In the debility of even a protracted fever, it is not so much the diminished quantity as the perverted quality of the blood, that, combined with the depressing influence and local suffering, produces this debilitating effect. Anything which relieves the local disease tends to increase the strength of the patient; and hence a loss of blood, when not too great, may diminish rather than increase prostration. Such is sometimes the case in loss of blood from congested and inflamed intestines in typhoid fever. Its dangers, however, must be acknowledged.

A general muco-intestinal inflammation complicates some cases of typhoid fever, in some instances occurring at an early stage, and in others at a more advanced period. There will then be increase of the abdominal symptoms, pain, tenderness, and diarrhœa, with mucous, or sometimes briny, discharges, meteorism, and more rapid prostration. The fever will be likely to be less remitting, and if the inflammation should involve the muscular and peritoneal coats, the diarrhœa might cease, the tympanitis might increase greatly, and speedy sinking follow. This more general enteritis is much more likely to occur in children than in adults, and is a serious complication, particularly in young children.

Complications of inflammation of the respiratory system are not unfrequent, and congestions of the bronchi and lungs are still more common. Generally there is more or less bronchial irritation, manifested by the cough developed by a full inspiration, by a tenacious sputum, and often by dry bronchial râles.

When more decided inflammation occurs, there will be an increase of the symptoms and signs, more or less difficulty of breathing, and, if the inflammation extends to the capillary tubes, as it sometimes does at an early period of the fever, great dyspnœa and cyanosis, and sometimes speedy suffocation and death, will follow. But the lung substance is liable to be affected, particularly toward the latter stages of the fever. There is often congestion of the posterior part of the lungs when the patient lies long on his back, and a hypostatic pneumonia is apt to occur, insidious in its approach, and resulting in splenization or a partial hepatization, with more liquid and less fibrinous exudation than exists in primary croupous pneumonia. More active attacks sometimes happen, marked by a sudden rise of temperature, pain in the part, bloody sputa, and the physical signs of pneumonitis, lobar and lobular. These complications are serious, and, when recovery takes place, the lung may be left in a consolidated condition from which it very slowly recovers.

In some cases tuberculous or other degenerations follow; and, occasionally, without these preceding conditions, acute tuberculosis succeeds to typhoid fever.

Pleuritic inflammation, sometimes resulting in empyema, may also complicate a case ; and all these conditions will present the symptoms and signs peculiar to their respective states, but they will be more or less obscured by the other conditions of the patient. These conditions require careful examination, and much depends upon the physical signs for their detection. As the bronchi and pleura may be involved at the same time, even the physical signs may be so obscured as to prevent an accurate differential diagnosis of the special condition ; but the existence of some complicating inflammatory disease of the respiratory organs can be made out by proper attention to all the symptoms and signs. The bearing which such complications have upon prognosis and treatment demands special attention ; they are estimated to occur in one sixth or one seventh of the cases.

In the weakened condition of the heart, and obstructed circulation of blood through the lungs, œdematous effusion into the latter organs is likely to take place, and sometimes it comes on so rapidly and extensively as to cause speedy suffocation and death. This accident is to be guarded against by keeping up the heart's action and the general strength, and is to be detected by symptoms and signs which will be pointed out when we come to the diseases of the respiratory system.

Cutaneous inflammations, erysipelatous and ecthymatous, sometimes complicate typhoid fever.

Ecthyma occurs mostly upon the nates and the parts upon which the patient lies, and may be induced by the discharges where proper attention is not given to them. The pustules may be few or numerous, and in low conditions they cicatrize slowly.

Erysipelas generally attacks the face, and is less acute and rapid in its progress than when occurring as a primary disease. It is, however, serious in its consequences when added to the other morbid conditions, and, according to Grisolle and others, one half die who are attacked with it.

Otitis is not uncommon, especially in children. It does not materially compromise life, but may lead to lasting deafness, and sometimes the inflammation extends to the membranes of the brain. This becomes a dangerous complication.

Inflammation of the parotid gland is another complication, not frequent, but, when occurring, it may be very serious in its consequences. The glands sometimes swell rapidly, sometimes suppurate, and sometimes sphacelate, and a large proportion of patients so affected succumb. It indicates a low and depraved condition of the blood and the general system, not only in typhoid fever, but in other diseases where it occurs.

Eschars formerly occurred in Paris, according to Louis, in one sixth of the cases, but they are generally less frequent at the present time, except where they take the form of "bed-sores," which, by proper precautions, can usually be avoided. When occurring upon parts not subjected to pressure, they indicate a very low condition of vitality, and are of very serious augury.

Inflammations, or other perceptible changes of the stomach, as already stated, are found in more than half of the fatal cases; and in a less, but considerable, proportion of cases that recover, more or less gastric congestion, irritation, or inflammation, takes place. The symptoms are nausea, vomiting, epigastric pain and tenderness, a more than usually red tongue, and an intolerance of food. These symptoms, however, are not always marked when changes, especially softening of the mucous membrane, take place.

When the length of the fever and the importance, toward the latter stages, of the digestion of food in order to keep up the necessary nutrition are considered, the condition of the stomach must be regarded as an important matter, and should be carefully looked after. Too much care can hardly be exercised in avoiding irritation and conserving the forces of this organ.

Congestion and inflammation of the brain occasionally complicate cases of typhoid fever, but most of the phenomena spoken of as "brain symptoms" are results of impure blood and its imperfect supply, and of the fever heat, which latter of itself is capable of seriously impairing the function, and, indeed, of producing structural changes, in this organ. Profound delirium, coma, convulsions, etc., occurring late in the disease, when the course has been severe with high temperature, would not present evidence of inflammation and its consequences; but these and other peculiar brain symptoms occurring early in the fever, should excite suspicion, if they do not furnish proof of the existence of an inflammatory, or at least a congestive, complication. The symptoms of organic brain lesions are so various, and so much resemble those from functional changes alone, that a differential diagnosis is often difficult and sometimes impossible. If, however, in connection with other decided brain symptoms, *early* in the fever, there be excessive heat of the head, with strong pulsation of the carotids, congestion of the eyes, and active delirium, running into a stupor from which the patient cannot be aroused, accompanied by paralysis and convulsions, or even without the latter extreme symptoms, an inflammation of the brain or its membranes may be inferred. Sometimes these conditions are consecutive to an internal otitis, as already intimated, and when brain symptoms occur in connection with this complication, inflammation should at once be suspected.

Parenchymatous hepatitis, marked by pain and swelling in the region of the liver, and increase of the fever, and sometimes by the occurrence of chills, with a jaundiced condition, occasionally complicates typhoid fever. If going on to suppuration, this condition, added to the phenomena belonging to the specific fever, is of serious import.

Rarely pericarditis and myocarditis, marked by pain and irregularity of the heart's action, take place; and degenerative changes of the heart from the high temperature more frequently occur.

When the kidneys are involved in inflammatory or other serious changes, urea is likely to be retained and to produce its peculiar effects. This may not always be distinguished from other forms of blood poisoning; but when the urine is scanty and decidedly albuminous or bloody, with uriniferous casts, inflammation would be distinguished, and if not soon relieved, the most serious consequences will almost certainly follow.

Inflammation and ulceration of the pharynx and larynx are sufficiently frequent and severe to require to be mentioned as complications. They are marked by pain and impaired function of the parts, by impairment or loss of the power of speaking and swallowing, and may be accurately observed by the laryngoscope or simpler methods of exploration. In connection with other conditions, these complications may contribute to a fatal result.

Rupture of the spleen and hemorrhage into the peritoneum may occur, causing death by shock and collapse; or suppuration of the mesenteric glands may produce fatal results, the inflammation being induced by rupture of an abscess into the same cavity.

Prognosis.—Any of the foregoing complications will have much influence in varying the prognosis, rendering it more grave in proportion to the importance and severity of each. There is scarcely another disease in which life is threatened from so many sources, and where assurances of results can be given with less certainty.

The general mortality in the hospitals of Paris is stated to be from eighteen to twenty-five per cent.; in Germany it has been much the same; while in London hospitals it is given as fifteen or sixteen per cent.

In private practice the mortality varies in different epidemics, but when the whole number of mild cases, some of which are not recognized, is taken into the account, it must be much less. In the mildest cases the temperature never rises above 103°, and sometimes does not exceed 101° or 102°, and the disease does not continue more than ten or fourteen days. The cases are mild when the temperature does not go above 104°, and the continuance is not more than sixteen days. The disease is severe when the temperature is repeatedly above 105°, and when it continues three weeks or more. A fluctuating temperature is more favorable than one that is almost uniformly high. But in any of the cases, even the mildest, complications or accidents may occur to render them dangerous or fatal; so that the prognosis should always be guarded. Moderate cases without particular accidents may be dangerous in the aged, the very feeble, in asthmatics, and especially in the alcoholic intemperate. It is less likely to be fatal in those who totally abstain, than in those who indulge in alcohol in what is termed moderation. Fat persons are more likely to succumb than those that are lean and muscular, and plethory, as well as obesity, is an unfavorable condition.

Death sometimes, though rarely, occurs at an early period, within a few days of the access, by the direct depressing effect of the poison, or by extremely high temperature. It, however, generally occurs at the latter part of the second, or during the third and fourth week, and not unfrequently later, from the continuance of the disease or from its complications or sequelæ, and sometimes from adynamia, exhaustion, and collapse. The ulcerations of the intestines may not heal, the diarrhœa and other abdominal symptoms may be kept up, and the patient become worn out late in the disease.

According to Grisolle, most deaths occur in the third and fourth weeks respectively; some at the end of the second, some during the fifth week, fewer during the sixth, and fewest of all during the first.

Death here, as in other cases, approaches by the heart, the brain, or the lungs—but in uncomplicated cases the greatest danger is from failure of the heart, especially where this organ was previously weak, and from failure of the action of the brain; and these failures are chiefly determined by the height and continuance of the fever heat. Great frequency and feebleness of the pulse are indicative of the heart's failure and are specially dangerous. As failure of the heart to carry on circulation is perhaps the most frequent ultimate or immediate cause of death in this disease, any condition previously existing or occurring as the result of the fever, either in the heart itself, in the vessels, in the lungs, or in the course of the systemic circulation, tending to obstruct the results of the heart's action, and to require more force to effect its work, must increase the danger. Hence, obstructive organic disease of the heart or large vessels; fatty degeneration or an obese heart; valvular disease; or atheromatous or other diseases of the large arteries; obstruction in the capillaries from whatever cause; diseases of the lungs, such as asthma or emphysema; deposits or degenerations within them of any kind, are known to increase the mortality in proportion to the degree of such obstructions.

The causes of death, in addition to the failure of the functions of the heart and brain from fever heat and exhaustion of their power, are:

1. Early implication of excretory organs and consequent increase of blood poisoning, or previous organic disease of the kidneys, or imperfect purification of the blood from whatever cause.
2. Peritonitis, with or without perforation of intestines, rupture of spleen, or extension from mesenteric glands.
3. Hemorrhage from the bowels.
4. Profuse and continued diarrhœa.
5. Inflammation of the respiratory apparatus, or congestion and œdema of the lungs.
6. Diffused inflammation of the stomach and intestines, with its consequences.
7. Inflammation of the brain and membranes.
8. Softening of the spleen, or severe inflammation of the mesenteric glands.
9. Inflammation and degeneration of the liver.
10. Endocarditis and myocarditis.
11. Parotitis and facial erysipelas.
12. Inflammation, ulcerative or diphtheritic, of the throat.
13. Sphacelations, or eschars, and extensive bed-sores.
14. The occurrence of miscarriage, and its consequences in pregnant women.

15. Stagnation of the blood in the heart, lungs, or capillaries.

Sex has but little influence on the mortality.

Age has some effect. The prognosis is generally considered more grave in the first five years; and yet I have seen many very mild cases during this period. From fifteen to twenty the cases are most favorable. From twenty to forty a little less so; and above forty they are more fatal in proportion to advanced years.

Although those who are depressed by anxiety, sorrow, bad hygienic conditions, and original feebleness of constitution, are, as a general rule, more likely to succumb, yet there are exceptions, and sometimes the most healthy and vigorous are cut down, while the less robust recover.

The puerperal state makes the prognosis somewhat worse, but not so much, when at the full period of gestation, as might be supposed. Caseau thinks it has but little effect.

It is thought by some that particular slowness of approach is apt to be followed by more severe forms, but there is no uniformity in this respect.

There are various particular symptoms indicative of special danger. These are great tympanitis, involuntary stools, muguet, a very dry, hard, and dark tongue, and much delirium, especially if early and violent. Coma, if profound and persistent, is particularly unfavorable, and subsultus tendinum is grave. Convulsions and tetanic rigidity of the arms and legs are regarded as almost certainly fatal symptoms, and yet after convulsions in children, and after rigidity of the arms in others, recoveries sometimes take place.

Dysphagia from paralysis of the pharynx, and Hippocratic facies, when well marked, indicate a fatal termination. Extreme frequency of the pulse is always a bad sign, and extreme slowness without improvement of other symptoms is also bad.

The Adynamic and Ataxic forms of the fever are most grave.

All complications increase the danger.

Intestinal perforation is nearly always fatal; and yet, as already stated, very rarely, exceptional cases may escape. Death from this cause generally occurs within two days, and sometimes within a few hours; but in rare cases life is prolonged, the inflammation is bounded by adhesive exudates, and an abscess is formed. If it ruptures into the general peritoneum, a fatal result is nearly certain to occur; and this may be after a degree of improvement in the symptoms has taken place.

Peritonitis, without perforation, is very apt to be fatal, but not as certainly so as from perforation.

Hemorrhage from the bowels is a grave symptom, as it is apt to be extensive; and especially as it indicates either decided and deep ulcerations, intense hyperæmia, or a hemorrhagic dyscrasia. In Paris hospital practice when hemorrhage occurs one half die. But in private practice, and according to my observation, a much larger proportion recover.

Eschars are bad signs, especially if unprovoked by pressure, irritating applications, such as blisters or sinapisms, or by filth and neglect.

In facial erysipelas in hospital practice, one half are said to die; and it is a bad indication anywhere in typhoid fever.

The general progress, or march of the fever, affords prognostic indications. When after a remission the symptoms become as severe as before, or more so, according to Chomel, the prognosis is very grave, as these cases are almost always fatal. According to my own observations this statement requires some modification, but it may contain a general truth. Relapses, though not severer in themselves than the first attack, are more likely to be fatal by reason of the condition induced by the first. But no one condition affords such evidence of the general character of the fever, and is of more prognostic value, than the height of the temperature. If the temperature rises above 105° Fahr., and does not fall below that figure for twenty-four hours, the case is grave, whether or not there be perceptible complications. If rising to 106° or 107° there is great danger; and if going above these figures and persisting, death is almost inevitable. Sometimes before death, according to Wunderlich, independent of complications, it rises to 108°, or even to 110.3°. When pneumonia occurs, while the fever is running on with an ordinary temperature of 103° to 105°, there will be a sudden rise independent of the evening exacerbation; and when such sudden rise occurs, however obscure other symptoms may be, an inflammation should be suspected and carefully sought for by physical exploration. Pneumonia will generally be discovered, often involving the posterior and lower part of both lungs, and constituting a very serious complication. The use of the thermometer by the physician at every visit is important, and its still more frequent use by the attendants, with its readings regularly recorded, would furnish great aid not only to the prognosis, but to a more exact diagnosis of the general and special conditions upon which indications of treatment, as well as the prognosis, depend. The lower the temperature, if not abnormally low, the more favorable. However, in collapse, or in great exhaustion from the loss of blood or profuse diarrhœa, the temperature may be low without improvement.

Diagnosis.—When the regular and ordinary phenomena of typhoid fever are presented in their usual order, it is not difficult, by taking them all into the account, to distinguish it from all other affections, although there is scarcely any symptom which of itself is pathognomonic. Some symptoms, however, have great diagnostic importance, as they are very seldom seen in other diseases. It is by considering the symptoms taken as a whole, or by adding one probability to another, that we arrive at reliable conclusions.

The most characteristic individual conditions and symptoms are: the gradual access; the diarrhœa, with peculiar discharges; the gurgling in the cæcal region, increased or developed by pressure; the distended, tub-shaped abdomen; the enlargement of the spleen, discoverable by physical examination; the epistaxis, slight but repeated; the intestinal hemorrhage; buzzing in the ears and deafness; the peculiar dreamy delirium; a debility often out of proportion to other symptoms and the continuance of the disease; a decided and often persistent cephalalgia; insomnia, and later stupor; toward the last, sudamina; and particularly the lenticular, rose-colored spots, coming one after another about the beginning of the second week, each one continuing about three days, repeated for a week or two—these, with the appearance in the stools of fragments of Peyer's glands, recognizable by careful examination with a lens, are sufficiently conclusive. In the absence of these more certain indications (and they are by no means always present), a union of several of the other phenomena will make the diagnosis satisfactory.

But all cases are not alike, as we have seen; and not unfrequently the symptoms, especially in the early stages, are not characteristic. Diagnosis in this stage is often difficult, and sometimes impossible. Some other diseases strongly resemble some of the cases of typhoid fever. The premonitory stage of the eruptive fevers, before the characteristic cutaneous phenomena occur; cases of inflammatory fever; visceral phlegmasia; gastric fever; accidental fever, with gastric and intestinal irritation and derangement; malarial fevers; acute catarrhs, etc., have many similar phenomena. All, however, come on more rapidly, as a rule, than typhoid fever; but exceptional typhoids are sometimes as rapid as they. We may have to wait for a fuller development before the nature of the case can be determined. If the weakness is quite marked, the insomnia persistent, if there is buzzing in the ears and dizziness, with a dryish tongue, and no evidence of local inflammation or other particular disease, we may presume typhoid fever to be present though many of the clearer evidences are absent.

After the first week the diagnosis can generally be made. If the ordinary and characteristic symptoms are not present, but the fever persists without other apparent causes, we are to act upon the presumption of the typhoid character of the fever. An acute fever continuing more than eight days, not malarial, and where a thorough and systematic examination fails to elicit evidence of local inflammation sufficient to account for it, and where typhus does not prevail, may be presumed to be typhoid, whatever special symptoms are absent. In distinguishing between primary inflammation and essential fever, an examination of the blood may aid the diagnosis. In inflammation the fibrine of the blood is increased; in fever it is not, but, on the contrary, is often diminished.

Age may aid in a presumptive diagnosis. The young and the adolescent are much more subject to it than the old—and in aged persons inflammations of the lungs are not unfrequently obscure or latent; and here the chest should be carefully examined. When this is skillfully done the local disease can almost always be detected.

The inflammatory affections with their accompanying fevers most resembling typhoid fever are: thoracic inflammations, peritonitis (especially puerperal), phlebitis, cystitis, and some cases of hysteritis. The fever of Asiatic cholera in its period of reaction often remarkably resembles typhoid, and very similar intestinal lesions are likewise often found *post mortem*. Some cases of acute tuberculosis remarkably resemble typhoid fever also, but these cases are rare, and will be particularly described under the head of tuberculous diseases. Severe enteritis, especially in children, may also much resemble typhoid fever. Meningitis, in some of its forms, much resembles the ataxic cases. A knowledge of these different diseases, with a careful comparison of the symptoms and course of each, will generally enable the physician to clear up the diagnosis.

But in rare cases all evidences may fail, and the diagnosis may not be completed until the *post-mortem* examination shows, or fails to show, the typical lesion.

In cases of recovery the falling of the hair, which is more likely to occur after typhoid fever than after other affections, may confirm the diagnosis.

Another sequela is inflammation of the lymphatics of the lower extremities, resembling phlegmasia dolens, but from which the patient commonly recovers, and which may aid in confirming the previous existence of the fever; so with imbecility and a mild mania, usually lasting a few weeks, but passing away as the nutrition of the brain is fully restored.

A more ravenous appetite usually occurs after a typhoid fever from which a good recovery is made, than after other similar diseases.

In some of the mildest, and especially in the abortive cases, the diagnosis will remain uncertain.

The differential diagnosis between typhoid and typhus and relapsing fevers, and between typhoid and dysentery, will be better understood after those diseases have been described.

CAUSES.

The causes of typhoid fever have given rise to much investigation and discussion, and upon some points professional opinions are still at variance. To go over this field of discussion, or to enter into the details of my own observations, would extend this article on typhoid fever beyond the limits assigned to it; and I shall content myself with stating little more than the conclusions to which long-continued study and observation of the subject have brought me.

That typhoid fever is a specific affection depending upon a peculiar material poison—a *materies morbi*—is now generally admitted. Though this material has thus far escaped positive physical detection and demonstration, yet, as in the case of malaria, the proofs in favor of its existence are too numerous and convincing to admit of rational doubt. The origin of this material, the precise conditions of its existence, its mode of production and increase, and its method of entrance into the system, and especially the manner in which it produces its effects, are matters about which there is still obscurity. That this poison has its chief habitat out of the body, in putrefying organic matter, especially in human excreta, seems sufficiently established; and that it often obtains access to the body through contaminated drinking water and other ingesta appears also to be proven. It is equally clear to my comprehension, from numerous recorded facts as well as from personal observation, that the poison is capable of passing from its sources through the atmosphere to the system, and thus infecting it. The production, multiplication, dissemination, and susceptibility of the system to its influence—the causes leading to the disease—are favored by long-continued heat and drought; and the poison is more likely to take effect upon young persons than upon the aged, and upon recent residents of the infected-region than upon permanent inhabitants. It is very much less liable to affect those who have once suffered from the disease; and many persons, to however much exposure they may be subjected, never have this fever. No age, sex, or condition, however, and no seasons of the year, no climates, and no countries are entirely exempt.

When a local epidemic breaks out, its connection can almost invariably be traced to foul privies, contaminated drinking water, milk watered from a foul source, or otherwise exposed to filth, imperfect sewerage, festering cesspools, or some source of organic putrescence.

This is so constant as to have caused Dr. Murchison, one of the very ablest writers on fevers, to call the disease Pythogenic Fever, indicating that it is "born of putridity." These statements as to the etiology of typhoid fever no longer admit of controversy. They are sustained by too numerous and too well-authenticated facts to be seriously disputed.

Without presenting in extended details the many reliably observed and recorded facts which sustain and illustrate the foregoing etiological statements, a remarkable local epidemic of this fever, which occurred under my own observation, is judged to be sufficiently important and typical to justify a brief account of it in a work of this kind.

The facts in this striking case were thoroughly investigated, and the cause of the disease was sought for in a systematic, rigid, and, it was thought, exhaustive manner, by a committee consisting of Drs. C. L. Ford, Pliny Earl, and myself acting as chairman—all at that time being professors in Berkshire Medical College in Pittsfield, Massachusetts, where the disease occurred.

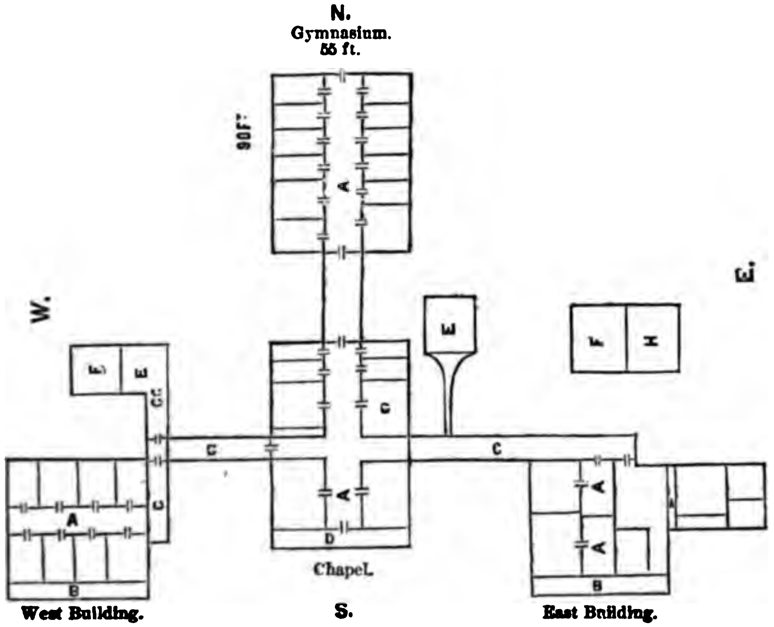
The facts elicited, of which an abstract will here be given, were published in the Boston *Medical and Surgical Journal*, and afterward in a pamphlet form.

In the latter part of July, 1864, there commenced an outbreak of typhoid fever in "Maplewood Young Ladies' Institute," located in an elevated and previously healthy part of Pittsfield, a village of 5,000 or 6,000 inhabitants, situated among the picturesque hills of Berkshire, a favorite resort for health and pleasure.

In this boarding-school, at the time of the outbreak, there were seventy-seven resident pupils, eight teachers, the principal and his family, which, together with the employed domestics, mostly females, constituted a household of one hundred and twelve persons, all boarding and lodging in the establishment. Besides these there were a few young ladies, inhabitants of the town, who were at the school as day pupils. The season was uncommonly hot and dry, there was but little wind, and considerable sickness prevailed in the town—mostly derangements of the digestive organs—but during the whole season there was less typhoid fever than usual, aside from the cases occurring at Maplewood; and, according to the testimony of the physicians of the place, there were not more than about a dozen cases in all.

In this household, from the 23d to the 29th of July, five persons were attacked with a severe fever; and during that period, and up to the 10th of August, when a term ended and the school was closed, some thirty others were sufficiently indisposed to have the services of a physician. At the close of the school, or a few days before, some deaths having already occurred, the alarm was so great that all who were not too ill to be removed dispersed to their homes in different parts of New England and of the Middle and Western States, a considerable number performing the journey with the early stage of the fever upon them.

Of the seventy-seven resident pupils, definite information was obtained by the committee of seventy-four. Of these seventy-four, sixty-six, or nearly ninety per cent., were more or less seriously ill at the time of the close of the school, or soon after; and fifty-one, or nearly seventy per cent., had well-marked, and almost all severe, typhoid fever, which proved fatal in thirteen cases.



A. Halls. B, Piazzas. C, Corridors. CC, Ladies' Corridors. D, Portico. E, Commodes. F, Sheds. G, Cabinet. H, Cottage.

Of the whole number of one hundred and twelve persons residing in the Institute, fifty-six had the fever, and sixteen died. Two young ladies, sisters, residing in another part of the village, but who were day pupils at the school, had the fever severely; and in a house on the opposite side of the street from the Institute grounds, some ten rods from the buildings, and in the direction of the prevailing winds at the time, two persons had a fever of the same type, and other members of the family suffered from gastro-intestinal derangements.

As nearly every person in this locality was more or less ill, and many of them with distinctive typhoid fever, while the disease did not prevail in other parts of the town, the existence of some local cause was naturally inferred, and such cause was sought for with the following results:

The Institute buildings, situated on large and elevated grounds, with perhaps a superabundance of shade from the large number of ornamental trees and shrubs, but in a naturally healthy locality, consisted of the structures the ground-plan of which is given in the annexed diagram; and a description is added, copied from the report of the committee referred to.

In the central building, consisting of two stories and a cellar, the first floor is occupied for recitation-rooms, cabinet, etc., and the second as a chapel and general study-room. The cellar contains furnaces, coal, vegetables, etc. On either side of the chapel is a building consisting of three stories over a cellar. That upon the east is called the "east building;" the other, the "west building." To the east building is attached a wing of two stories, with a basement. The basement of this wing, together with a part of the cellar or basement of the main building, is occupied as a kitchen and store-rooms; the other part as a cellar proper, containing coal and furnaces for heating the parts above. The first floor of this building is occupied for parlors, library, dining-room, and the apartments for the family of the principal. The two stories above are used as dormitories for the pupils—a lady teacher occupying one room on each floor. A hall passes through the centre of each of these stories, from east to west. The rooms of the pupils are upon both sides of the halls, opening into them, and receiving their heat from them in cold weather. The basement of the west building is occupied as a laundry; and the other three stories as dormitories, arranged as in the two upper stories of the east building, and as shown in the diagram.

The gymnasium is situated in the rear of the chapel, and consists of two stories and a cellar, or basement. The first floor has rooms chiefly for practice in music; while the second, a large and high room, fifty-five by ninety feet, is used as a gymnasium proper. The basement is a depository for fuel, and contains the furnaces for heating the building.

The privies were situated as marked in the diagram (commodes)—one near the north-east corner of the chapel, and the other not far from the north-east corner of the west building.

The buildings were all connected by covered passage-ways or corridors, and these covered ways were extended to the privies, as is also shown in the diagram.

A few rods east of the north-east corner of the east building was situated, until removed in July, a barn, which had been there for many years, and the barnyard, which extended toward the east building, was in part lower than the surrounding ground, containing water in which swine were reported to have wallowed, and which frequently emitted offensive odors. The kitchen drain opened some eighty or ninety feet from the corner of the building, and though an attempt was made by a temporary expedient to cover the course of the stream of slops flowing from the large kitchen, it was but partially effected, and in the hot weather unpleasant odors issued from this source.

The drain from the laundry under the west building opened upon the surface of the ground fifty-six paces south-west from the south-west corner of the building, and thirty feet from the sidewalk of the public street; and the water from it, after being detained and partially absorbed, as alleged by the principal, in a large covered cesspool, issued at the point before mentioned, sometimes at least in a condition to annoy those who passed in its vicinity. The committee observed a small cesspool near this point, but it appeared at the time of their investigation not to have been recently used as a receptacle.

The vaults of the old privies, which had both been removed when the committee made their inspection, were represented to them as having been shallow, and filled nearly to the surface of the ground with semifluid materials, as they were the receptacles of the slops from the chambers.

One of them was once cleaned out at night in the course of the hot season before the outbreak.

From ample testimony of the pupils and others, there was no doubt that the privy vaults particularly, and also the opening of the drains, emitted during the hot and dry weather decidedly, and sometimes exceedingly, offensive odors, so that windows were obliged to be closed, particularly at night, to prevent the influx of the outer air, as the confined atmosphere within the rooms was less offensive than the air from without.

Though some of the dormitories were small for the number of persons occupying them, and were not provided with any special or artificial means of ventilation, yet they were as they had been in previous seasons of health, and, compared with other similar institutions, the crowding was not excessive.

The bathing arrangements, discipline, exercises, and studies in the school were all such as are usual in well-conducted boarding-schools, were such as had existed for years before, and could scarcely be regarded as objectionable.

The diet, so far as could be ascertained, was sufficient and wholesome; the water for drinking and domestic use was from hydraulic works of excellent construction, bringing it from a pure mountain lake in the neighborhood, and was used by others without unpleasant effects.

On the principle of exclusion, and in view of other well-known facts, the condition of the privies, and possibly the drains, containing a poison which was received into the susceptible systems of young persons through the air, was concluded to be the essential cause of this terrible calamity.

In further support of this conclusion it should be stated that though the morbid influence pervaded every part of the premises where the pupils roomed, and to which they resorted, it did not manifest itself quite equally in all the apartments. It showed more of its effects nearest the chief sources of the offensive effluvia.

A farther quotation from the report of the committee will show more clearly the details of the facts already sketched, and cannot fail to give great force to the views expressed.

The following table shows the number of pupils rooming on each floor of each building; the number sick on each floor, just before, at the time, or soon after the close of the school; the number sick with *fever* at the same time; the number of deaths in the building, and the number dying elsewhere; the percentage of sickness; the percentage having fever, and the percentage of deaths of the cases of fever.

Rooming in EAST BUILDING.	No. of Occupants.	No. of Sick.	No. Sick with Fever.	No. of Deaths.	Deaths in Buildings.	Deaths out of Buildings.	Per cent. of Sickness.	Per cent. of Fever.	Per cent. of Deaths by Fever.
Second Floor	20	17	12	1	1	0	85.00	60.00	8.33
Third Floor	21	21	16	4	0	4	100.00	76.19	25.00
Total	41	38	28	5	1	4	92.68	68.29	17.85
WEST BUILDING.									
First Floor	10	9	9	4	1	3	90.00	90.00	44.44
Second Floor	11	10	7	1	1	0	90.00	63.63	14.28
Third Floor	12	9	7	3	0	3	75.00	58.33	42.85
Total	33	28	23	8	2	6	84.84	69.66	34.78
Total of both Buildings	74	66	51	13	3	10	89.18	68.97	25.49

From this tabular statement, which may be seen at a glance, but which is worthy of careful study, and which the committee were able to make only after most extensive inquiries, continued for some months, and involving a correspondence with about a hundred persons, it will be seen that the percentage of the number of cases of sickness in the east building was greater than that of those in the west; the percentage of fever, however, was greater in the west building, and the percentage of mortality much greater there. By referring to the diagram of the grounds, it will be seen that the west building was more exposed to fæcal effluvia, by the closer proximity of one of the privies, and by the hall being directly connected with it by a covered passage; and the testimony of the pupils and their friends shows rather more complaint of the odors in the west building than in the east. On the other hand, the east building was much nearer the site of the old barn and the offensive pool near the opening of the kitchen drain; and the privy on the east side of the chapel, though not communicating directly with the hall, yet indirectly, through the corridor, was represented as being, a part of the time, in a peculiarly bad state. This is the one which was cleaned out one night, producing the odor said to be so intense. The classes reciting in the "Cabinet," a room on the first floor of the chapel building, near the privy, were reported as being often much annoyed by the odor, especially when the windows were open.

As to the amount of influence which the different degrees of crowding exerted in predisposing to attacks, the facts are not sufficiently numerous to determine. The following, however, may be taken for what they are worth.

In the west building three lady teachers roomed—one on each floor. On the first and second floors they occupied the rooms alone, and remained well. The one on the third floor roomed with a pupil, her sister, and both died after returning to their home. The southeast corner room of the west building—first floor—was occupied by three pupils. One died, and both the others had the fever severely. In the east building three teachers roomed, all in separate apartments. Of the two who were on the second floor, one had very severe typhoid fever and the other was not ill. The one on the third floor escaped the fever. Most of the rooms in both buildings were occupied, each by two pupils; and generally there was little difference in the crowding or the ventilation.

From these, and so many other facts of which these are but types, the inference seems irresistible that typhoid fever is, often at least, produced by a poison emanating from foul privies, cesspools, and drains. But these facts do not solve the questions as to the original source of such poison, its essential nature, and the method of its multiplication. Whatever may be the presumptions, they are not demonstrative of the fact that typhoid fever is always produced by such poisons, or by any extraneous influences. Neither do these facts, as related, determine as to the contagiousness or non-contagiousness of the fever. They only prove that in these and similar cases the disease is produced by an infection, by a poison, which in this case emanated from foul privies, and was communicated through the air. Other facts prove that a poison is communicated through drinking water and through milk; but the literature on these points is too abundant and well known to require reproducing here.

It has long been thought that typhoid fever has more than a single origin, and some of the most recent writers on the subject, as L. Colin, Professor of Epidemiology in the Military School of Val-de-Gras, France; S. Jaccoud, Professor of Pathology in the Faculty of Paris; the late Professor Grisolle, and others on the continent of Europe, as well as the late Dr. Murchison, one of the very ablest writers in the English language on the subject, hold this view.

M. Colin enumerates five sources of the fever.

1. Infection of man by man, producing a miasm of *encombrement*, as he calls it, where numbers together create an atmosphere, without previous specific germs, capable of inducing the disease.

2. Putrid infections—a poison produced by organic, and especially excrementitious fermentations and decompositions—as in privies, sewers, etc., but without evidence of previous germs.

3. Infection by drinking water or milk contaminated by foulness.

4. Auto-infection—that is, the accumulation, from mal-nutrition and deficient elimination, of poisonous matters capable of inducing the malady. To this he attributes a large part of the causation.

5. Contagion—but to this he attributes little comparative influence, and where it operates as a cause, it is much more influenced by the atmospheric and other surroundings, and by the receptivity of the patients, than are other diseases exclusively contagious.

M. Jaccoud recognizes three modes of production.

1. Extrinsic—where there is a miasm produced out of the body, embracing the first three of M. Colin's causes.

2. Contagious—the transmission of a poison through fæcal matter from the intestines of patients ill with the disease.

3. Spontaneous—embracing M. Colin's fourth cause, or auto-infection, where the disease is generated within, from imperfect nutritive processes or deficient elimination.

Dr. Murchison's views are well known. While admitting its transmissibility under certain conditions, he contends strongly for its production *de novo* in putrescence of organic matter, particularly fæcal, without any connection with original germs from typhoid patients.

On the other hand, Dr. Budd and many others are of the opinion that a specific germ derived from the *system* of a typhoid patient is always essential to the production of the disease; that this germ may preserve its vitality for a long time in fæcal and other matter, and that when introduced into a susceptible system by any means, it becomes the cause, and the only cause, of the disease. In other words, Dr. Budd and his adherents contend for the essential contagiousness of the disease, and that the only source of the production of the poison is in the bodies of typhoid patients.

But even according to this view of the case, it must be admitted that this fever has no degree of contagiousness, in the ordinary acceptation of that term, comparable with the eruptive fevers, such as small-pox or measles, since persons are seldom affected by coming in the vicinity of, or in contact with, typhoid patients; and where one after another of these in the same locality is taken with the disease, all being exposed to the same general causes alike, it is generally impossible to say whether a poison is transmitted from one person to another, or whether the original cause or influence has operated alike on each.

That the poison is not readily conveyed from person to person—from those laboring under the disease to others taking care of them, as is the case with small-pox and measles—was illustrated in the Maplewood fever, as it has been in so many other instances.

In the dispersion of the patients to their homes, one or more cases of typhoid fever of a very virulent character were introduced into between forty and fifty families, and it must be supposed, and indeed it was known, that in those families there were many young persons and others susceptible to the disease; but in not a single instance did the disease spread from these numerous foci. One young girl, a sister of one of the Maplewood patients, some three or four weeks after the latter's recovery, had an ordinary attack of typhoid fever; but this was the only case that occurred among some hundreds of persons who must have been exposed, including families, neighbors, and friends. So far as ascertained, no attempt at isolation had been made, and a single case among so many may reasonably be regarded as fortuitous or accidental.

Still, it should be explicitly stated and borne in mind that other facts, in numerous instances, have occurred and been recorded where a locality free from typhoid fever has been made a focus for the spread of the disease, apparently by the advent of a person laboring under the affection. In such cases the facts generally seem to indicate that the poison is disseminated by the intestinal typhoid discharges being thrown, without disinfection, into the vaults of privies, where probably the poison, multiplying and undergoing changes, finds its way through the air or ingesta, and produces its effects. It is *possible* that the germs escaping from the body of the sick, either by the bowels, the skin, or the lungs, pass more directly into the bodies of the well and produce the disease; but it must be acknowledged that such cases are rare and doubtful.

The question still remains as to whether the poison of typhoid fever is produced *only* in the bodies of the sick, or whether it has an external or spontaneous origin, or whether, in fact, the disease may not be produced by causes other than a single specific poison.

In view of all the facts I have been able to gather, I am strongly inclined to the opinion that a single living germinal poison, capable of preserving its vitality for long periods, is the cause of typhoid fever; that the primary origin of the material is involved in the obscurity which pertains to the beginnings of all the lowest forms of life; that a material is produced, or rather multiplied and temporarily harbored, in the bodies of persons having the fever; that it possesses but little capability, if any, of producing the disease in the condition in which it is expelled from the body; but that in fæcal matter, and other forms of filth, it is capable of multiplying, undergoing changes, and becoming active when taken into the system, either in the air or the ingesta (water, milk, etc.), producing the disease in those that are susceptible; but that it is frequently taken into the system and expelled or destroyed without producing serious effects; that the poison is produced both without the body and within it; and that typhoid fever may, therefore, properly be called a *miasmatic contagious* disease, as it is by Liebermeister, the French writers, and others. This, it is true, is only a theory; but let us see how it will tally with the facts so frequently observed, and which were typically presented at Maplewood.

We will suppose that, by some means or other, a few, perhaps inactive, typhoid germs were introduced into the accumulated fæcal matters in the privy vaults whose condition has been described. Finding a favorable nidus they multiplied with great rapidity, changed their form and character, rose with the effluvia into the atmosphere, passed into the bodies of these young persons, who, at the same time, inhaled quantities of decomposing matter in which these microzymes abound. In the external filth, or in the body, they acquired numbers and assumed characters which produced those changes in the fluids and tissues, causing the phenomena of fever. As they were expelled from the system, during the course of the disease, in different places, they were not directly active, or did not pass into the systems of susceptible persons, and not finding a favorable soil for their development they became quiescent or perished. These germs are parasitic, but, like many other parasites in different stages of their transformations and different periods of their lives, they exist out of the body in which they produce their effects. It is so with the tape-worm, the trichina, and others. The diseased condition produced by this trichina was once supposed to be an inorganic aerial poison, but it is now known to be parasitic.

This view of the cause of typhoid fever is partly suggested by analogous facts of recent discovery. Cohnheim, in his recent work on Pathology, says: "This theory no longer hangs in the air."

The discovery of the Recurrens Spirilla, by Obermeier, in the blood during the attack of relapsing fever, and their disappearance during the week of its absence, to appear again in equal numbers in the week of recurrence, is regarded by Cohnheim as an important step on the road to our knowledge of infectious diseases.

A peculiar disease in cattle, not unfrequent in some parts of Germany, called the "Milzbrand," is found to be produced by a rodlike bacteridia. This illustrates the theory that has been suggested of the transformation of parasitic germs, and their ability to maintain their vitality out of the body, thus producing miasmatic contagious diseases.

These rodlike bodies producing milzbrand in the cattle die soon, but they produce and leave spores which retain vitality under almost all circumstances—out of the body, in the soil. When these spores are introduced into the blood of an animal through an abrasion, they develop into *bacilli*, or active, rodlike bodies, and by their rapid increase, elongation, division, etc., the disease in the cattle is produced. When their active life is over, the disease abates, their sporules are thrown off and lie dormant indefinitely until they obtain an introduction into the blood, when they develop and produce the disease.

The production of "Chicken Cholera," as shown by the experiments of Pasteur, is another illustration of the views now receiving general assent.

As applied to other diseases, this method of production is but an hypothesis, but the hypothesis commends itself as explaining many facts. Something of this kind may occur in the poison producing typhoid fever, certain conditions out of the system favoring the preservation, multiplication, and activity of the microzymes, and certain conditions of the body favoring their activity within it in the production of disease.

But whatever may be the specific material producing the fever, and whatever may be the mode of its production and action, there are certain conditions favoring the action of the poison, or at least favoring the occurrence of the disease, which are better understood.

It is a disease of world-wide prevalence; it may occur epidemically, endemically, or sporadically; it attacks with great impartiality all ranks and conditions in life, in city and country, the weak and the strong, without much regard to crowding or isolation; and may occur wherever there is fæcal accumulation and fermentation, or foul sewer emanations. These are quite as likely to occur in the deep-walled vaults of the privies about the houses of the wealthy, as in the more shallow receptacles of the cottages of the poor; or in the sewer-pipes opening into palatial residences in the city, as in the absence of all sewerage about the open rookeries of the squalid.

Sex is without much influence upon its occurrence; but age has a decided effect. It is most frequent between fifteen and thirty, next perhaps between twelve and fifteen—not unfrequent in children; but after thirty it becomes more and more infrequent as age advances—but in rare cases it occurs in the old. It is more likely to prevail in autumn and summer, but it may appear at any season; and is more apt to attack recent residents in a place where it is endemic than the older inhabitants.

The great preventable cause is filth, chiefly accumulated fæcal filth and sewer gases, especially when their emanations pass into houses, or in any way get into the drinking water—as where privies or leaking sewers are near wells.

This somewhat extended discussion of the character and causes of typhoid fever has been thought to be required because of its wide-spread prevalence, its great frequency, its severity, and its destruction of so much young and vigorous life, and also because so many of the facts and principles which have been brought out apply with slight modifications to other infectious diseases. It is a typical specimen of specific fevers, and we shall make it a standard of comparison and point of departure in the account to be given of others of this class.

Treatment of Typhoid Fever.—The treatment of typhoid fever is divided into Prophylactic and Curative.

The Prophylactic treatment is suggested by a knowledge of the causes we have been considering, and consists in their avoidance or removal. It should ever be borne in mind that, whatever may be the specific poison essential to the causation, effete and decomposing organic matter favors its production and effects, that the malady is a "filth disease"—a "pythogenic fever."

As the most obnoxious form of filth is human excreta, its disposal requires primary attention. The common privies, constructed by excavating the earth and depositing the excreta in these receptacles, where they are allowed to remain indefinitely, are *abominations*, and should be abolished absolutely and entirely. If they are under cover and connected with the dwelling, they become doubly abominations.

If in porous soil, and their contents are not confined by tight walls, they are likely to soak through the earth, particularly if moist, and to percolate into the wells, polluting and poisoning the water.

If the vaults are closed by cemented walls, there is no escape for the decomposing and horrible material but by passing off in gases and effluvia into the air.

Murchison and others are of the opinion that these places are capable of generating the typhoid poison *de novo*; but whether this be the case or not, there seems no doubt that when germs of the poison are introduced into them by the discharges of typhoid patients, or in any other way, they multiply with great rapidity, and are likely to pass off with the foul emanations.

These foul gases form a nidus for the specific germs, and when together they enter the system, either by the air or in the ingesta, they are more likely to produce the fever than when the germs are introduced alone and more directly from those suffering from the disease. Much is said of *overflowing* privies and cesspools. Fullness to or near the surface is by no means necessary to injurious conditions. The destructive and offensive *overflowing* is by the gases and effluvia, which are quite as ready to rise out of deep as shallow vaults; and the deep vaults are much less likely to be cleaned out often than the shallow ones. Indeed the deeper vaults are more profound abominations, most permanent, and less likely to be disinfected. Their offensiveness and dangers are incapable of removal but by the constant and abundant use of dry earth or other disinfectants, and when these are efficiently used, an above-ground receptacle is far more easily managed and better in every respect.

What is called the "Dry Earth System" for the disposal of excreta requires particular attention. Fæcal deposits immediately covered with dry earth have all their offensiveness absorbed, become immediately changed mechanically and chemically, and are fitted to minister to vegetable growth in the soil to which, without bad odors or disgust, they may be transferred.

This is not the place to enter into the economical bearings of this subject; but a statement of the principle of this system, in relation to decency, and especially to health, to the prevention of zymotic diseases, and particularly of typhoid fever, is proper here. Though so long, and still so often overlooked, this principle in human hygienics and decency is at least as old as Moses, whose directions respecting a paddle for each weapon were well adapted to the condition of the wandering Israelites; and doubtless long before the time of that hygienic reformer this was understood and practiced by the domestic felines, and with more than human wisdom and consistency has been continued by them ever since.

Sewers, if imperfect, as unfortunately they are apt to be, are as dangerous as privies, especially if they permit the escape of gases and effluvia into dwellings, or leakage into water for domestic use.

All suspected water or milk should be boiled before being taken. The addition of wine or any form of alcohol to the drinking water, unless in such quantities as to insure another form of poisoning, will not destroy the injurious materials within it. Cleanliness in its broadest sense—a virtue properly characterized as next to godliness, indeed it might be styled a part of godliness—is the great preventive remedy for typhoid fever and other zymotic diseases.

There can be no doubt that decomposing matters in the system, whether generated and retained there or taken in from without, either in ingesta contaminated by sewage, or in the inhaled air containing emanations from night-soil, cesspools, or foul drains, either themselves produce disease, or serve as a nidus for specific germ poison. Filth has been defined as certain forms of matter out of place. Human *filth* consists of matter after its uses in the system have ceased, which is generally undergoing destructive changes, and which is offensive to the senses or noxious to the organism. The speedy removal of this and all other forms of offensive or noxious matters, and their return to the *earth*, where they are oxidized and undergo changes that destroy their offensive qualities, and fit them for use in entering into vegetable organisms, constitutes cleanliness. The prompt use of the means for accomplishing this constitutes the practice of this virtue so strongly commended. It applies not only to the person, the clothing, the food, the furniture, and the dwelling, but to the air and the surroundings as well.

As the specific germs of typhoid fever are believed to be chiefly in the intestinal discharges when leaving the body, the care and treatment of these evacuations becomes a matter of the utmost importance. As already directed, these discharges should be thoroughly disinfected or buried in dry trenches far from any sources of drinking water. The best and most convenient disinfectants for this purpose are carbolic acid, chloride of zinc, permanganate of potash, chlorine solutions, iodine, and solutions of sulphurous acid. One or the other of these articles, in strong solution and free quantity, should be placed in the night-stool or bed-pan which is to receive the discharges, and not only poisonous qualities but offensive odors will thus be destroyed.

"Burnett's Disinfecting Fluid" consists of twenty-five grains of chloride of zinc to a fluid drachm of water. An ounce of this to two pints of water makes a solution proper for use.

Permanganate of potash is the basis of "Condy's Antiseptic Fluid." Two or three drachms of this, or half an ounce of the tinct. of iodine, or proper quantities of some of the other articles should always be used.

When articles of clothing are soiled by discharges, they should be disinfected. This can be done by soaking them in a mixture of two ounces of the solution of the permanganate of potash in a gallon of water, and afterward placing them in boiling water. Any articles may be disinfected by exposing them for two hours or so in an oven heated to 220° F.

If these precautions are taken, the introduction of a case into a locality, in all probability, will not lead to a spread of the disease.

The importance of preventive measures cannot be exaggerated, and it is far better to use many unnecessary precautions than to neglect those of the least consequence.

Curative Treatment.—In the management of cases, besides the prophylactic and hygienic measures, which afford the best conditions of life, the leading indications are to antidote the poison ; to eliminate effete matters from the blood by the bowels, kidneys, liver, and skin ; to abate extreme heat ; to quiet excessive cardiac and arterial excitement ; to modify the disease of Peyer's patches and the solitary glands of the intestines ; to control too free diarrhœa ; to relieve the accidental complications and all distressing symptoms, and toward the later stages of the disease particularly, to sustain the strength ; and all the way through by mitigating the severity of the symptoms to prevent the degeneration and failure of organs, and obviate the tendency to death.

It may not be possible to fulfill all these indications, or to use means specially and directly tending to accomplish all these purposes. We know of no positive and certain means for specifically antidoting the poison in the body, and the conditions of the system may be such as to prevent efforts for accomplishing some of the other objects. They are objects, however, which it is desirable to attain ; but we must consider how many of them can be accomplished by means that will do no other or greater mischief. It is best here not to strike heavy blows in the dark, to use no perturbing measures which may do harm, without a specific and rational object in view, or where experience will not fully justify their use. Placing the patient under favorable life conditions and "giving nature a chance," is better than too much or injudicious interference. Since the disease, as a rule, will run its course, since it is not capable in the present state of our knowledge of being generally interrupted, as are the malarial fevers, it is the duty of the physician to conduct the patient through, as the mariner does his ship while the storm rages, and when he is unable to bring it into a harbor.

Two leading methods have been advocated and pursued in the treatment of this disease—the Expectant and the Positive or Modifying. The expectant method—or placing the patient under as favorable hygienic conditions as possible, and not attempting to interfere with the course, and only in exceptional cases with the symptoms of the disease—was long a favorite in Germany, France, and elsewhere, and is still so with some practitioners; but it has of late yielded, in Germany especially, to more positive methods of interference.

This Positive Method is divided into the Antidotal or Specific, the object of which is to neutralize or expel the poison, or at least to cut short the disease; and the Symptomatic, the object of which is to modify conditions and symptoms favorably, but still without attempting to arrest the disease; simply to so mitigate phenomena as to enable the patient to endure it.

As Antidotal, Specific, or Abortive agents—medicines for fulfilling the first indication mentioned—quinine, mercury, and iodine have been used. In some cases each of the agents, particularly mercury and quinine, has seemed to produce an antidotal effect, or to arrest the disease; but neither of them has been used with sufficient success to establish a reputation as an abortive agent. They are, however, believed to be capable of rendering the disease milder, and of shortening to some extent its course, and for this purpose they are used in the very early stages of the fever. Mercury has most testimony in its favor. Wünderlich, Niemeyer, Parks, Wood, Harley, Liebermeister, and others advise it in the early stage; and the authority of such names cannot be set aside as unworthy of regard. The views are not uniform as to its mode of action or the doses to be given. Some, as Dr. Harley, advise it particularly for its action upon the liver, believing it to increase and modify its secretion, and to improve its general functions, regarding this organ as having much to do in the phenomena of the disease. Others think it tends to eliminate the poison, or to improve the condition of the stomach and bowels; while others, without attempting to explain its particular mode of action, simply refer to personal experience and the testimony of statistics to prove its beneficial effects.

Some recommend it in doses of three or four grains of blue mass, repeated once in three or four hours for one, two, or three days; others in ten-grain doses of calomel, repeated a few times, securing a cathartic effect; and the general testimony of those who have made a fair trial of it is, that it renders the disease more mild, and often diminishes its continuance.

There is some statistical testimony in favor of the use of quinine in large doses as an abortive agent. But it certainly does not generally succeed in arresting the disease, however useful it may be in mitigating some of its phenomena. It is quite possible that in many of the cases where it has produced an abortive effect, the disease has been malarial rather than typhoid—or at least the poison producing it has been different from that which causes the ordinary forms of the disease. Indeed, not unfrequently in particular localities, peculiar forms of fever occur, which are usually called typhoid, or sometimes bilious, etc., but which would seem to be produced from an influence different from that which causes a typical typhoid fever. It is quite possible that some such cases may be controlled by quinine or other abortive agents, and we should not despair of ultimately being able to arrest typhoid fever, as we now can malarial fevers and rheumatism. Some cases of this fever spontaneously abort, the poison producing effects, but not its full action as in ordinary cases; and it is not unreasonable to suppose that therapeutical agents may favor such a result. In the present state of our knowledge, however, we cannot expect abortive effects, as a rule, from any agents at our command, and we are not justified in administering with that view powerful medicines that may do harm to the organism. I repeat, however, that general experience, and certainly my own, justifies the judicious use of mercury in the early stage of the disease, and occasionally conditions occur at a more advanced period when this article is useful. I have never given the large doses of ten or twenty grains of calomel, a few times repeated, which have lately been advised, and therefore cannot speak of it from experience. I have, however, generally given a few—two or three—doses of two to four grains of blue mass, combined with ten or fifteen grains of bicarbonate of soda, followed in a few hours after the last dose with a very mild laxative, if the blue mass does not itself operate as such; and the results enable me to recommend this as proper. Large doses may be more efficient, but such doses may do harm by irritating the gastro-intestinal membrane, and by occasionally producing mercurialization with its depressing consequences; and the beneficial effects of such doses are not so positively established as to incline me to their use. The moderate doses, followed by laxatives, are comparatively free from injurious or dangerous consequences, and are often markedly useful.

The laxative to succeed the mercurial may be a mild saline, such as part of a bottle of liquid citrate of magnesia, a drachm or two of

Rochelle salts, or of sulphate of soda in a large solution, or the following castor-oil emulsion :

℞ Oleo Ricini, Mucil. Acacia,
Aqua Camphora.................... *āā* ℥j
Sacch. Alba........................ ʒij
M.

For an emulsion. Dose, ʒiij to ʒiv.

If there be much irritation of the bowels, five to ten drops of tinct. opium—or an equivalent quantity of some other opiate may be added ; or, if too active a catharsis is induced, more decided opiates may be given to check excessive and depressing effects. Occasionally a very slight laxative will cause a powerful effect. Much caution is therefore necessary in the use of cathartics, even of the mildest kinds, and occasionally the diarrhœa is so early and so decided as to forbid their use entirely ; but in such cases small doses of mercurials, combined if necessary with opiates, are not contraindicated. On the contrary, such a combination will tend to alter the conditions which result in these excessive discharges. Rather free evacuations are, however, desirable. Injurious materials may be thus eliminated, congestion relieved, and more severe inflammation prevented.

In some cases, after a day or two, two or three of the mild mercurial doses may again be given once in three or four hours, and again followed by a gentle laxative if required. If the characteristic diarrhœa is present and decided, the laxative may be omitted ; and if the discharges are excessive and debilitating, they may be moderated by opiates. Elimination, however, is desirable, and the evacuations should not be too much suppressed.

Some have recommended the continuance of the mercurials until their specific effects are produced, as indicated by the gums being touched. This cannot be done without producing a spanæmic effect and an ulcerative tendency, which could hardly fail to be injurious.

Grisolle is of the opinion that mercury has no special advantage over other cathartics, but he thinks evacuant treatment with some of these articles useful in this fever, and advises their repetition from time to time during much of its course. While unirritating laxatives are admissible, drastic purgatives must scrupulously be avoided, as they will not only depress the patient, but will increase the intestinal inflammation. As the disease advances, and the patient becomes more debilitated, and the patches of Peyer have become ulcerated, all forms of cathartic should, as a rule, be avoided, and, in cases of constipation, enemas should be substituted.

The testimony in favor of the preparations of iodine is not sufficient, in the absence of personal experience, to enable me to recommend its use.

After the first few days of the continuance of the fever, all efforts to abort it, or to materially shorten or interrupt its course, will, as a rule, be futile; and the object of treatment should be to conduct the case to a favorable termination. With this object in view, different modes of management have been advised and practiced, the extremes being a pure expectancy on the one hand, and the systematic *antipyretic* method of Liebermeister and others of the modern German school on the other.

If the disease is mild, and no conditions are present other than those necessarily belonging to the fever, little more than expectancy is required. Proper hygienic management, the *regular* administration of proper *food*, fresh air, frequent *bathing*, scrupulous cleanliness, and all the other conditions mentioned under the head of "the management of fevers in general independent of medicines" must be observed.

A mild eliminative course, the use of some gentle diuretic and diaphoretic mixture may alone be indicated. The following will be found at least innocent, not unpleasant, and generally useful:

℞	Liq. Ammonia Acetatis	℥ij
	Spts. Nit. Dulc	ʒj
	Syr. Ipecac	ʒss
	M.	

Dose from one to three drachms every third or fourth hour, given in a free drink of water. This may be continued during a large part of the course of the disease.

Some advise the mineral acids, Phosphoric, Hydrochloric, or Sulphuric, very largely diluted, as having a sustaining effect, and correcting a tendency to excessive alkalinity of the blood. Antiseptics, such as chlorine, iodine, hyposulphites, carbolic acid, and creosote have also been advised with the view of preventing or diminishing putrescency in the system. About a minim and a half of carbolic acid, with a minim of tincture of iodine, well diluted in water, has been recently recommended every hour or two for a time, and then in less frequently repeated doses; this is said to diminish the fever and make the patient quite comfortable. Experience on a large scale has not as yet proved the efficacy of these remedies, as patients treated with antiseptics chiefly have not, it is said, recovered in greater proportions than where a more expectant method has been pursued.

Some, looking upon typhoid fever as a disease of debility, have advised what is called a tonic and stimulating treatment—bark and alcohol from an early period, and throughout its progress; but many others declare that results do not justify this course.

Others, again, have advised depletion by the lancet as a generally applicable remedy; but it has fallen into disuse—is regarded by some as always injurious, and in uncomplicated cases it is certainly unnecessary; and if carried to any considerable extent it would generally, in the long run, be injurious. Yet there are cases where it may be used with decided advantage, where a plethoric state and certain congestive and inflammatory conditions are present.

Though in uncomplicated cases pursuing their necessary course, the use of medicines, with the exception of the early evacuants, is of doubtful utility (and even the use of these is discouraged by some modern writers), yet there can be no doubt that some particular symptoms and complications may be mitigated by treatment, and various remedies are positively demanded in the management of many cases.

If profuse and exhausting diarrhœa occurs, it should be moderated, but not entirely arrested, by opiates and unirritating astringents. Among the astringents the subnitrate of bismuth, acetate of lead, tannic and gallic acids, and sulphuric acid should be mentioned. One of the most efficient remedies in controlling diarrhœa, and at the same time fulfilling other useful indications, is the emulsion of the oil of turpentine, with such additional quantities of laudanum as the case may require. The formula for the emulsion will be given further on. The ordinary doses of the other astringents, adapted to the severity of the case and the conditions of the patient, are intended to be advised. Sometimes opiate and astringent enemas will be more efficient in allaying irritation of the bowels, and checking the diarrhœa, than when the medicines are given by the mouth; and this mode of their administration is particularly important when the stomach is intolerant of them. The following, for that purpose, is advised by Dr. Tanner:

℞	Olei Terebinthinæ	min. 30
	Tinct. Kino. fl.	drs. 2
	Extracti Opi. liquidi	min. 10–25
	Mucil. Amyli. for	oz. 2

Make an enema. Use two or three times in twenty-four hours, as may be needed.

In a strong and plethoric patient, with local congestions or inflammations, and a high arterial pressure, a bleeding may be of the greatest service. Local bleeding in cases of severe pain, when the blood can be taken from near the congested or inflamed part, will be more efficient in giving relief, with a less debilitating effect, than when venesection is practiced. When severe congestion or inflammation of the intestines occurred, the application of leeches to the anus was formerly much practiced, and, as a rule, the relief was greater than when the same amount of blood was taken from other parts ; but the practice is attended by certain inconveniences, and sometimes by injurious local consequences, which have caused it to fall into disuse. From the involuntary discharges which, in severe cases, so frequently occur, the leech-bites are apt to inflame and suppurate, and, in very low cases, to become gangrenous. When leeches are applied in this situation, great care as to cleanliness and in protecting the bites from being irritated, is requisite. Though bleeding in any form in typhoid fever is generally not required, in exceptional cases it is essential to the best results.

When there is much excitement of the heart and arteries, with a *strong* as well as rapid pulse, and a high temperature, veratrum viride or aconite, cautiously given, may be useful. A very rapid pulse, if feeble, contraindicates the use of these articles, which would further diminish the heart's power. Digitalis, when there is much heat, with rapidity and feebleness of the heart's action, is regarded as being indicated. Wunderlich, Niemeyer, and others, have much confidence in it, and there are doubtless cases where its judicious use is attended by beneficial results. It is, however, somewhat uncertain in its action, in some cases disturbing the nervous system more than it strengthens the heart or abates the fever; and a cumulative and too profound effect upon the heart, greatly slowing its action and thus obstructing the circulation, is possible from the quantity ordinarily advised. Wunderlich and others direct that from fifteen to twenty grains be infused in ten ounces of boiling water, and given in divided doses during each twenty-four hours. Others recommend it in powder, in about two-grain doses once in three to five hours, and Niemeyer particularly advises it in connection with moderate doses of quinine, with a view to the abatement of the fever.

My own use of digitalis in typhoid fever has not been sufficient, and, so far as tried, has not been apparently favorable enough to enable me to positively advise it, or do much more than refer to the testimony of others.

If there is much pain or great restlessness, *anodynes* are indicated. The opiates, as a rule, are altogether most reliable, and various preparations may be selected, adapted to the conditions of each case.

Other articles may often be added to the opiate, modifying favorably the effects.

The bromide of potassium or sodium, given in connection with morphine and camphor, may be useful.

℞	Bromide Potassium...............	ʒj
	Sulph. Morphia..................	gr. j
	Gum Camphora....................	grs. x
	Pulv. Ipecac....................	grs. iij
	M.	

Make into six powders. One; to be repeated as required.

Or the mixture called Cloridium may agree well.

Besides the officinal preparations, the following may serve as examples of useful mixtures: ℞ Hoffman's Anodyne, Aromatic Spts. of Ammonia, Liquor Morphia, U. S. P., *āā* ℥ss; Camphor Water, ℥ij. M. Dose, a table-spoonful as needed.

Or: ℞ Spts. Nit. Dulc., Chloric Ether, *āā* ℥ss; Morphia Sulph., gr. j. M. Dose, a tea-spoonful, more or less, as may be required.

In some cases morphine, hypodermically, will better fulfill the indication.

When from idiosyncrasy, or any cause, opiates are not well borne, chloral hydrate, cautiously administered, or other anodyne and soothing agents, may be substituted. The fluid extract of Jamaica dogwood has lately been used as a substitute for opium with satisfactory results.

When there is much determination of blood to the head, with restlessness, bromide of potassium in free doses, combined with other means, will be useful. The bromide is applicable when there is cerebral congestion, whether there be restlessness or stupor; and, as much heat of the head is generally present in such cases, cold may be applied to the head and neck with great advantage, either by ice-cap or towels dipped in ice-water and frequently changed, or by a cap of rubber tubes through which a stream of cold water is allowed to flow. In plethoric patients, local depletion by leeches may be demanded; or, in other cases, free dry cupping will be better. If severe headache occurs from irritation, rather than from active congestion, anodynes and counter-irritation are indicated. If from inanition and exhaustion, food and stimulants are required. Much care in discriminating between these conditions is necessary—the force of the heart's action particularly, and all the circumstances of the case must be observed, and their indications estimated.

If there be pain in the abdomen, which is sometimes severe and depressing, opiates will generally be required, aided by fomentations, poultices, or water dressings, and, in obstinate cases, sometimes by leeches. Sometimes, after the fever has run its course, pain and tenderness of the abdomen continue from the condition of the ulcerated intestines, involving to some extent the peritoneum in inflammation. In such cases blisters over the abdomen, in addition to other measures, will often be markedly useful.

If there be a persistent active diarrhœa, indicating, as it usually would, a more serious disease of Peyer's patches and the solitary glands, perseverance with the opiates and astringents already mentioned will often be required. Various prescriptions of opium and ipecac., of acetate of lead, of tannin, of alum, and of bismuth, are advised. Sulphuric acid, both from its tonic and astringent effects, is often used.

℞	Dilute Sulph. Acid	♏xxx
	Tinct. Opi	♏x
	Decoction of Bark	℥ss
	M.	

Once in four hours.

Or:

℞	Acetate of Lead	grs. ij–v
	Acetic Acid	gtts. iij–v
	Acetate Morphia	gr. ⅛
	Cinnamon Water	℥jss
	M.	

Take once in four hours.

Or nitrate of silver, in the more chronic cases, in doses of a quarter to half a grain, in compound soap pill, once in four or six hours.

Some advise emulsions of oily substances with gum acacia and water—regarding small quantities of castor-oil in such mixtures as useful.

But, as a rule, for the purpose of modifying the condition of the ulcerated intestinal glands, and thus controlling the dependent diarrhœa, the turpentine emulsion is best. The formula, often modified in the proportion of its ingredients to meet the conditions of particular cases, which I have long used is as follows:

℞	Ol. Turpentine	ʒiijss
	Tinct. of Opium	ʒiij
	Gum Acacia,	
	Sacch. Alba *āā*	℥ss
	Aqua Camphora	℥iij
	M.	

Make into a perfect emulsion by thorough trituration. Dose ʒj, more or less, once in three to six hours.

To each of these doses may sometimes be added with advantage, especially when there is much tympanitis from fermentation changes in the food, one or two grains of pure carbolic acid. I cannot too strongly recommend the turpentine emulsion in these cases, as it not only exerts a favorable effect upon the diseased intestines and the diarrhœa, but upon the general condition of the patient as well. The combination has seemed to me to soothe and sustain the nervous system, to moderately increase the secretions, to improve the condition of the bronchial membrane, and by its eliminative and stimulating effect to improve the state of the blood.

I long ago learned the use of turpentine in these cases from Dr. G. B. Wood, and the opinion in its favor is supported by Graves, Huss, Wunderlich, Murchison, and many others. Convinced of its beneficial effects, independent of its local action upon the intestines, I have often prescribed it when no excessive diarrhœa or other marked abdominal symptoms were present. It has seemed to me not only to exert a very favorable influence upon the intestines after ulceration has occurred (indicated by the red glossy tongue, decided diarrhœa, etc.), as Dr. Wood and others so strongly contend, but to allay the preceding inflammation and to diminish the tendency to ulceration as well. The steady moderate impression of the laudanum and camphor, prevented from arresting the secretions and otherwise modified by the turpentine, enables the patient to bear the disease with less shock and suffering. But whatever the explanation, the general effect is often markedly beneficial.

The chlorate of potash, in doses of from five to eight grains once in a few hours, may modify favorably the ulcerated Peyer's glands, and also improve the blood. It has a gentle eliminative effect, but must be given in very small doses well diluted, or omitted altogether if it produces irritation of the gastro-intestinal mucous membrane.

When there is much tympanitis the gas should be evacuated by placing the patient on the chest and knees, or in some position with the pelvis elevated above the rest of the body, and introducing carefully into the rectum an elastic catheter. The position indicated facilitates the introduction of the tube and secures the evacuation of the gas as it tends to rise to the highest point by its light specific gravity and by the pressure of the viscera when in that position. It is well also to prevent distention, by a broad firm bandage around the abdomen, often with wet cloths or turpentine stupes beneath.

Hemorrhage from the bowels, if from the capillary vessels and not too free, is often useful, as it is followed by amelioration of nearly all the symptoms; but if it is profuse, fresh, or clotted, it is of course dangerous. As it is impossible to predict to what extent it may go when once commencing, means should, as a rule, be taken, even when it is moderate, to arrest the flow, and when profuse they must be vigorously applied. For this purpose bladders of ice should be applied, particularly to the right side of the abdomen, and astringents used by the mouth or rectum, or both. The solution of perchloride of iron, in doses of thirty minims in a wine glass of water. from two to five grains of the acetate of lead, or from half a drachm to a drachm of the fl. ext. of ergot, or a full dose of ergotine hypodermically should be given. Or:

℞	Acetate of Lead....................	grs. x
	Acetic Acid........................	♏ x
	Acetate Morphia....................	gr. ss
	Aqua pura..........................	℥iv
	M.	

For an enema, given with hips elevated, and best through an elastic tube introduced into the colon.

Or a solution of persulphate or perchloride of iron with morphine in twice the ordinary doses by the mouth, dissolved in about four ounces of water, given in the same way. More fluid, given at once, would be likely to be passed off immediately, and a smaller quantity would be less likely to reach or approach the bleeding point. Attention to details, to the manner of administering remedies, of handling, moving, and nursing patients in so enfeebled and critical conditions, cannot be too strenuously insisted upon.

In severe bronchitis interfering with respiration and oxygenation of the blood, dry cups freely applied, various expectorants, such as small doses of ipecac., three-grain doses of flowers of benzoin, and the turpentine emulsion may be required. Inhalations of steam, simple or medicated, may aid expectoration, and modify favorably the condition of the membrane. Where other means fail to expel the accumulated mucus, an emetic may possibly be borne and required.

If congestion of the lungs and the passive pneumonias so apt to occur are present, quinine in decided doses will be indicated; and the strength should be kept up by proper feeding and judicious stimulation; and (acting mechanically, but often beneficially) dry cups may be applied to the limbs and lower part of the chest in free numbers. Jaccoud advises forty or fifty on the lower limbs and base of the chest, repeated morning and evening, when the broncho-pulmonary alteration becomes a source of danger. Ligation of the extremities would similarly answer the indication.

Sordes should be removed from the mouth by the patient's sucking slices of lemon or orange, aided by mechanical means if required.

The condition of the bladder should be carefully observed, and the viscus should be completely evacuated twice a day, the catheter being used when necessary for that purpose.

If perforation and acute peritonitis occur, opium should be given in free but not poisonous doses, pieces of hoop should keep the bed-covering from increasing the pain by their weight, light fomentations should be employed, and the patient kept perfectly quiet.

It is well, in anticipation of the long course and exhausting effects of this fever upon the blood and tissues, to keep up as far as possible the nutrition of the patient from an early period of the disease, by the administration of such easily assimilable food as he can bear and appropriate. That the disease is one which tends to adynamia and exhaustion, that danger arises from such exhaustion, and that so far as possible it should be prevented, there can be no question. The question is, what measures will tend most to prevent this result. In disease as in health, assimilated food is the great source of force. Medicinal stimulants may increase activity and enable the organism to take and utilize more food, and thus indirectly sustain power. Various substances may check, remove, or modify morbid conditions, and thus prevent depression and exhaustion; but the only source of permanent power is food. Hence the importance, in a protracted exhausting fever, of its judicious management. If more food is given than can be digested or appropriated, it will be a source of irritation and greater depression. The remedy does not then consist in free feeding, either in small quantities frequently repeated, or in larger ones more seldom given; but in a judicious selection, adapted to the needs of the system and the capacity of appropriation. It will readily be seen that no positive and inflexible rule can be given as to the quantity or quality of the food; for though typhoid fever has some features that are constant and measurably uniform, there are others, depending upon the peculiarities of the patient and the character of the complications, and indeed upon the severity of the essential disease, which are exceedingly variable.

But food should be given regularly and systematically, governed by the effects observed and by the judgment of the physician, and not entirely by the desires or aversions of the patient, and not at all by the whims and prejudices of ignorant nurses or injudicious friends. Milk mingled with moderate quantities of thoroughly cooked farinaceous substances, should be the staple in most cases; beef-tea should be added in the later stages especially, and sometimes very finely disintegrated tender muscle, slightly or not at all cooked. Eggs thoroughly beaten up, raw or very slightly cooked, and mingled with milk or water, and sweetened or not, as may be relished, often answer well. A proper, relishable quantity of salt should be added to each preparation. Milk has more food properties than beef-tea, but the latter is more stimulating and sometimes more easily assimilated, and is particularly required in the latter stages of the disease, and more depressed conditions of the patient. When the stomach is incapable of receiving and retaining the necessary quantity of food, these liquid preparations may be given by enema. Life can sometimes be sustained for long periods in this way.

To give some idea of the quantity of food to be tried, it may be mentioned that a tea-cupful of milk, slightly diluted with water if very rich and creamy, with the addition sometimes of a spoonful of lime-water, and slightly thickened with well-cooked farina or finely pulverized cracker, may be borne once in four or six hours. It is often better to give it more frequently, and in smaller quantities at a time. Beef-tea in quantities of half a tea-cupful, more or less, at a time, may be alternated; more if the stomach is not disturbed or oppressed by it, and less if that effect is produced, or the food passes undigested.

All agree that in the latter stages of the fever, in severe cases, when the powers of life are so far exhausted that they threaten to cease, every possible means should be resorted to in order to sustain their action and keep the patient alive until the crisis of the disease is passed. There is, however, diversity of opinion as to the means for accomplishing this end. In addition to the food, which all believe to be important, much confidence is placed by many in the action of medicinal tonics and stimulants, while others have less faith in their virtues. However interesting and important the subject, it would lengthen this article to an unjustifiable extent to give all the views of even eminent and authoritative writers upon it.

The articles more commonly advised are the preparations of Peruvian bark, strychnine, ammonia, camphor, musk, and alcohol. That under certain circumstances all of these articles are capable, either directly or indirectly, of increasing temporarily vital activities, is generally believed, and must be regarded as an accepted doctrine of therapeutics. The manner of their action, and the degree of their power, is far from being settled. The greatest difference of opinion exists, or at least the most decided expressions of difference are, in relation to alcohol. Other questions than those of a strictly scientific and therapeutical character have influenced opinions and expressions. On the one hand, personal experience, the habit of using alcoholics, and the real or fancied feeling of increased vigor after taking an habitual or an occasional potion of the article, incline many to the opinion that it is a sustainer of vital power, without rigidly considering whether that feeling is deceptive or the result of a habit—the relief of a feeling of depression and discomfort resulting from the indulgence itself. It would be difficult to persuade the opium eater that his favorite narcotic was not a genuine stimulant—an exciter of vital actions—when his habitual daily dose raises him from the most utter prostration and the depth of despondency to a sense of strength, to real activity, and a feeling of delight. To him, for the time being, it is a stimulant, though opium is essentially a *narcotic* and a paralyzer of many functions, and can scarcely be regarded, in the normal condition of the system, as a real exciter of any. Entertaining views of the stimulating and sustaining effect of alcohol which are opposed by others, and indulging in a practice which some denounce, produces a partisan feeling which sometimes, at least, seems to interfere with a calm professional judgment. Custom and authority most naturally have an influence upon opinions and practice, preventing an unbiased decision, such as would be arrived at upon a new question removed from partisan feeling. On the other hand, those holding decided opinions as to the injurious effects of alcohol in health, and who are strongly impressed with its terrible physical, social, and moral evils, are liable to have their opinions influenced in the other direction, and are inclined to conclude that an article which so certainly weakens a well man when taken in quantities to produce a perceptible effect, can hardly be regarded as a strengthener, *par excellence*, to a sick one. But while they may justly come to the conclusion that it ought not to be regarded as a pure and essential stimulant, they may unjustly conclude that it has no virtues in sustaining action under the extraordinary conditions of a severe disease, and especially in persons who are habituated to its use. It should be regarded as a purely therapeutical question, and discussed as we would discuss the question of the action of opium, mercury, or arsenic, in a particular disease. But, considered in this way, it is by no means easy to come to a positive conclusion as to its value in typhoid fever, or under what circumstances it should be given or withheld. While the weight of authority is in favor of its use in the latter stages and depressed conditions of typhoid fever, a majority of the best observers are opposed to its indiscriminate use, and the recent statistics of the London hospitals show that those which use the least, down to an extreme minimum, have the smallest mortality. Other circumstances, however, may have determined this result, and the question as to its value is an open one. My own belief, based upon long-continued observation, mostly among patients unaccustomed to the use of alcohol, is that such patients *very seldom* require it in typhoid fever; never at an early stage, and doubtfully at any time. Yet it has been my practice, and, following authority, it would still be, to resort to it where depression was extreme in advanced stages of the disease, and under the circumstances and according to the rules to be described.

I can well understand that with persons who have been accustomed all their lives, and their ancestors before them, to the daily use of alcohol, this article can be better borne in disease, and may be more needed than with those who have abstained from it or have taken it only occasionally. It may be that in European countries, where the habits of the people are so different from ours, depriving a patient with this fever of his accustomed beverage would lead to more depression than would occur under its continuance; and I am not prepared to positively deny that the patients of M. Jaccoud, of Paris, nearly all of whom are accustomed every day to take a considerable quantity of wine, may continue to take, as he recommends, about half a pint of claret in the twenty-four hours without injury, and perhaps with benefit, in this fever; and that three or four grammes of the extract of bark may also be added. This he recommends with an increase of the alcohol, adding thirty grammes a day—or about an ounce of brandy—if the case be severe. But I feel confident that the patients I have had to deal with would be injured, rather than benefited, by even this moderate quantity of the alcohol, and that in ordinary cases it should be dispensed with entirely.

The American country and village practitioner should not follow too closely, with his abstemious and previously healthy and vigorous patients, whom he sees at the beginning of their diseases, the directions of physicians who have never seen patients outside of large European cities, and seldom till their diseases are advanced. The conditions of these classes are so different in so many respects, that the same directions will not always apply equally well to both. But even in these large cities the indiscriminate and general alcoholic treatment is condemned by very many of the highest authority, and, in London, the comparative statistics are decidedly against the practice. Those who advocate the general use of alcohol do so on two grounds, viz.: its stimulating and sustaining effect; and its supply of fuel to the fever, so that the tissues will not be so freely consumed in the production of heat. How far either of these supposed modes of action is real, are questions undecided. Though some small quantities of alcohol may be oxidized in the system (not more than an ounce and a half in the twenty-four hours in the physiological state, but possibly more in certain morbid conditions), yet it chiefly acts as a neurotic, and particularly as a narcotic. As such it often diminishes shock, and "the wear and tear" of the nervous system under suffering, and thus prevents exhaustion. Though it often seems to act as an excitant, it fails to develop more power in a healthy organism; but it may increase activity in disease by counteracting a depressing agency, or often by *paralyzing inhibitory nerve functions.* Its effects are uncertain, and not capable of being estimated. It expands capillary vessels, but diminishes their action; and, by bringing more blood to the surface, may cause greater loss of heat and thus reduce the temperature; and, though it is oxidized in small quantities, it commonly diminishes the oxidation of other substances, such as fat, in the system; and it retards various other organic changes. Its food effects in health are certainly inconsiderable, if not null, and, as a rule, are probably the same in disease; while its sustaining power, so far as it possesses any, is produced in a similar way to that of opium, by its impression upon the nervous system. That when there is a deficiency of oxidizable material in the system, a larger quantity of alcohol may be oxidized than in the normal state, is believed by many, and I am inclined to think it is true; and, if such be the case, a real sustaining effect may be realized. But this will be uncertain in any given case, and is scarcely to be relied upon as a rule. It disturbs injuriously natural functions in health, and may do so even more in disease. Prescribing it is unsatisfactory, as we can never be confident beforehand whether the results of its administration will be harmful or beneficial. Harmfully, it may prevent the excretion of the fever poison; it diminishes aeration of the blood, may impair the processes of nutrition, and often irritates and injures the mucous membrane of the stomach. In considerable quantity it neutralizes the gastric juice in the stomach and arrests digestion, though, in smaller doses, it may, by inviting the blood to the peptic glands, increase their secretion, and aid digestion temporarily after its impression and absorption.

It may diminish the heart's action by its direct narcotic or depressing power, or it may increase it indirectly by relieving shock, which may be still more depressing.

It diminishes general healthy muscular power, as its direct effect, in proportion to the quantity taken, but may, in morbid conditions, increase it indirectly by relieving shock, sense of fatigue, or other depressing conditions.

It may beneficially, in fever, diminish abnormal waste of tissue—may soothe the nervous system like opium or chloral, inducing sleep, and preventing wearing and exhaustion. The good in some cases may overbalance the evil, but it should be used in the light of modern physiological investigation, and the actual results of clinical experience, rather than in a routine way from precedent and fashion, without considering the harm as well as the possible good it may do. Drs. Gairdner and Russell, of Glasgow, Sir Henry Thompson and Sir William Gull, Dr. Brinton, and especially Dr. Richardson, of London, and many others, condemn its general and free use in fevers. Some of these discard it entirely, others advise it in exceptional cases only. In the Vienna Hospital it is said now to be seldom used at all.

It is not physiological or normal to the system, is injurious in health—is either a poison or a medicine, beneficial only in modifying morbid conditions.

As with other narcotics, its effects upon the general functions, rather than upon the sensations merely, must determine the propriety of its medicinal use and continuance. When useful, its regulated and steady administration, rather than its unsystematic and fluctuating use, is important. To direct, "Give as much (whisky, brandy, or wine) as the patient will take," is not only loose and unscientific, but *bad*, and can hardly fail to do harm.

In deciding upon the use of alcohol in a case, the condition of the circulating organs is most important to be observed. A very rapid, very feeble, or very slow pulse often indicates shock, which may be relieved by it. If, in a case of rapid pulse, the pulse is made more rapid by the alcohol, and especially if the face is flushed, it must be discontinued.

In low delirium and stupor, caused by shock or adynamia, it may be tried; and also in *subsultus tendinum*. On the other hand, in throbbing headache and noisy acute delirium, it is generally regarded as being contraindicated. If there be suffusion of the eyes and sufficient cardiac pulse, it is not to be given.

If the tongue be brown and dry, with general depression, it may be tried. If the tongue is made dryer the alcohol should be suspended—if more moist it may be continued.

In pyæmia, pneumonia, erysipelas, and other similar complications, there is apt to be more shock, and the alcohol is more likely to be useful. But in these complications quinine is a much more important remedy, and should be given in free tonic, but not extreme sedative, doses. A continuous, and not a sudden and interrupted impression should be made. Three, four, or five grains, once in three, or four, or six hours, would be indicated.

It is in accordance with general observation in the case of opium and other narcotics, that their discontinuance in those habituated to their use commonly produces shock and temporary depression; and it is often so with alcohol. It may be an unfavorable time for its discontinuance when typhoid fever is present; and, at any rate, it may be safely inferred that those accustomed to its use bear it better and require it more frequently in disease than those who habitually abstain from it. The previous habits of the patient must be taken into the account in prescribing this and other remedies in typhoid fever as in other diseases. The form of alcohol to be used is of some consequence; the tastes and previous habits of the patient may be consulted; but no form is so reliable, or the quantity so easily ascertained and regulated, as that of pure alcohol largely diluted with water.

"Antipyretic Treatment."—The consideration of one of the most important indications in typhoid fever, with the means for fulfilling it, has been left until the present, in order to give it more prominence.

It is well established that a very high temperature, especially when constant and long continued, is of itself exceedingly disastrous, leading to degeneration of tissues and failure of power; and that this condition is the one most to be dreaded, and if possible remedied, in typhoid fever. A more clear appreciation of this fact has led many modern physicians, and particularly those of the German school, to seek for safe and efficient agents for lowering the temperature. Systematic efforts for diminishing fever heat, as the chief thing to be done in this disease, constitute what has been called the "Antipyretic method of the German school."

The two principal methods for reducing the high temperature are:

1. The direct abstraction of heat by cold applications to the body, especially externally; and,

2. Preventing the production of heat by medicinal agents, supposed to act largely upon the heat-producing nerve-centres, but also upon the nerves, vessels, and tissues—upon all parts concerned in its generation; and also by agents which produce *increased loss* of heat in a medium at the ordinary temperature, by bringing the blood

more freely to the surface, and by causing perspiration and evaporation.

The principal agent for directly abstracting the heat is the cool or cold bath; and the chief medicinal agents for preventing its production are quinine and salicylate of soda, though the bath, it is contended, when properly used, acts also by diminishing production; and the quinine and salicylate of soda, by causing perspiration and perhaps by other means, doubtless promote loss. Whatever may be their mode of action, they are the chief agents for preventing and diminishing the high temperature.

Exposure to cold air abstracts heat; but when it causes contraction of superficial vessels the blood is driven to internal parts. This tends to the diminution of loss and the increased production and retention of internal heat. This physiological arrangement in health preserves the normal temperature, and in fever keeps up in a large degree the abnormal heat.

The cold water bath abstracts heat more rapidly and thoroughly; its effects are produced more deeply in the body; and by a sedative, or at least by some peculiar systemic effect, the excessive production and retention of heat are prevented. By the bath, when thoroughly used, the temperature of the whole body is reduced, not only for the time in which it is used, but for a greater or less length of time afterward. But immersion in cold water is not without possible injurious effects, and some are of the opinion that the dangers in typhoid fever are decided.

It may be followed by great depression. The heat passing off rapidly may cause an exhausting effort on the part of the system to restore the temperature—the blood may be driven to internal organs and violent congestions produced; so that, as with every other powerful therapeutic agent, care and discrimination are necessary in its successful use, and much and varied experience will be required to ascertain its degree of safety and value, and the particular conditions which call for or forbid its employment.

In hyperpyrexia the indications are to reduce the heat without causing exhaustion, and to prevent its excessive production without doing other harm. It is often easier to point out indications than to find and successfully apply the means for fulfilling them. A long experience in the hands of a few, and particularly a large recent experience of several German hospital physicians (Liebermeister, Ziemssen, Juergensen, etc.), as reported by these distinguished gentlemen, seem to show that the water bath properly regulated may, to a large extent at least, fulfill these indications—reducing heat and preventing its excessive production without danger to the organism.

Ziemssen advises, when the temperature rises to 104° F., to give a full-length bath at 94° F., gently rub the surface, and add cold water gradually, reducing the temperature of the bath to 68° F.; keeping the patient in the bath for twenty or thirty minutes, or until slight chilliness is felt, then remove to a comfortably warm bed, especially warm at the feet, and repeat the bath when the temperature again rises.

Liebermeister's plan is to put the patient in a bath of 68° F. for ten minutes, then put in a bed warm at the foot—repeating so as to keep the heat down.

When only a moderate reduction of the heat takes place from the bath the blood is driven internally, and the heat production may be increased, as it is by the regulating power of the system after exposure to cold in health ; but the reduction of the heat may be forced beyond the regulating power of the system, and the temperature of the whole body lowered, externally and internally ; and the effect even in severe cases may be made to last for several hours. But the heat will in time come up, when the bath must be repeated—a persistent repetition night and day—six, eight, or more baths in the twenty-four hours may be essential to the proper carrying out of this system. After a time, it is alleged, the *production* of heat is diminished, and the bath is not so frequently required.

Ziemssen's method would seem to be preferable to Liebermeister's in feeble states, or where the propriety of the treatment is at all doubtful.

Leibermeister and Ziemssen advise that the effect of the bath be aided by *Antipyretic Medicines*, when it is not promptly efficient of itself in keeping the temperature down decidedly below the dangerous point.

In the Vienna Hospital the reported practice is to place the patient in a bath at the temperature of 65° F., continuing it for twenty or thirty minutes, and repeating, as may be required, on an average in severe cases seven or eight times in the twenty-four hours. Great success is reported to have followed this exclusive treatment.

There is certainly inconvenience, and in low and advanced cases with ulcerated bowels, some danger in removing a patient from his bed, and placing him in the bath. The *Fever Cot* of Dr. Kibbel obviates this handling of the patient, with its shock and fatigue, and allows the more free application of water to the trunk, where it is more needed than at the extremities, and it may be an improvement in method.

M. Jaccoud recognizes the importance of reducing the temperature when excessive, and advises that when it rises to 39° C. (102.2° F.) cold lotions be applied twice a day. If rising to 39.5 C. (103.1° F.)

he applies the lotions three times a day, if to 40° C., or more (104° F.), still more frequently. Instead of water he advises pure aromatic vinegar for the lotion; a blanket, over which is an oil-cloth, is placed under the patient, and the vinegar is freely and rapidly applied with large sponges to the entire body. The oil-cloth is then removed and the patient wrapped in the blanket until he is dry. The lotions are diminished in frequency as the fever declines, but are continued occasionally until it is quite gone. If cold sweats occur, as he says is sometimes the case, the lotions are to be discontinued, but there are no other contraindications to their use.

In placing patients in the bath after the manner of Ziemssen and Liebermeister, the danger and inconvenience of handling can be reduced to a minimum by lifting them upon a rubber or oil-cloth sheet with rods rolled up in the margin; the sheet should remain under the patients in the bath, and may be gently pulled away after they are placed in the bed. Other methods of applying cold may be resorted to.

The *Antipyretic Medication* consists in giving free doses of quinine, salicylate of soda, salicylic acid, digitalis, veratrum viride, aconite, or gelseminum.

The three last-named articles are objectionable, especially in the advanced stages of the disease, when the danger from the heat is greatest, in consequence of their sedative action upon the heart. This is already weakened, perhaps degenerated, by the continuance of the fever, and it is the failure of the function of this organ which is the most frequent cause of death. The digitalis, as already stated, though sometimes useful, is uncertain in its action, and less decided in reducing the temperature. The salicylic acid, though exceedingly efficient in rheumatism in controlling the fever, has not been sufficiently tested in typhoid fever to justify its being spoken of here with the same confidence as the quinine. The salicylate of soda, however, has been largely used of late in some of the German and Swiss hospitals, and is thought to be nearly equal to the quinine in reducing the temperature when sufficiently large doses are given, and to disturb less the brain and nervous system.

Quinine is the article which has been chiefly used by the German physicians in such numerous cases and with such favorable results as to commend it at least to attention and further trial. Liebermeister gives from twenty-two to forty-five grains at once, or within half an hour; but the dose is not to be repeated for twenty-four hours, and, generally, not sooner than forty-eight hours. If its action is satisfactory the temperature is reduced to about 100 F., or less. If this result is not obtained, the dose is to be increased at the next time of its administration. If the temperature is brought down to 98° F., or lower, a smaller dose must be given the next time.

It is alleged that it has been given in this manner in many hundred cases, without any seriously unfavorable effects properly attributable to it, and that when it was used in connection with the baths, thus preventing the high temperature, the mortality in the hospital at Basel was reduced from the former percentage of 27.3 under expectant treatment, to 8.5 under the strict antipyretic treatment.

The reports from other sources of the effects of quinine in typhoid fever have not been so favorable either as to the reduction of the heat or the mortality; but, so far as I know, the antipyretic treatment, whether in the use of the bath or of quinine, has nowhere been carried out in the same way as in Germany, Switzerland, and Austria. Very recently, in the Fever Hospital of London, the antipyretic treatment, particularly with the cold bath, has been vigorously pursued, and with, it is said, most satisfactory results. The patients are placed at once in a bath at the temperature of about 60° F., but are kept there for a comparatively short time, following the method of Liebermeister rather than Ziemssen. Not only has the rate of mortality been low under this treatment, but the course of the fever is said to have been diminished in duration. It should be mentioned that Liebermeister advises wine in moderation in connection with the use of the bath; and when the heart's action fails he relies much on camphor, musk, hot alcoholic mixtures, etc., to keep it in action.

Jaccoud, in addition to the lotions for the reduction of the fever, when the temperature rises to 39.5° Cent. (103.1° F.) gives quinine in doses of from eight to fifteen grains, repeated until marked temporary abatement of the fever occurs and the evening temperature is lowered.

According to my experience, quinine in doses of from five to ten grains, and sometimes less, repeated once in from two to three hours, will reduce the temperature in a few hours from 104° or 105.5° F. to about 100.5° F., where it will usually remain from fifteen to thirty-six, or sometimes forty hours, when the quinine may be repeated if the temperature rises.

This use of quinine to abate the heat, in addition to careful attention to the other indications as they arise, has been my method of treating severe cases for some years past.

During the summer of 1880, I had an opportunity of visiting the principal hospitals of Germany, Switzerland, Austria, and France, and making special inquiries respecting the antipyretic treatment of typhoid fever. I found this method much more used at Basel, Zurich, Leipzic, Berlin, and Vienna, than in Paris. While the testimony in all but the latter city was decidedly in its favor, there was no uniformity of opinion as to its value or the special means of carrying it out. The almost exclusive remedies made use of were the cool or cold bath and free doses of quinine and salicylate of soda; but there were some diversities of opinion as to the comparative results of these agents, and also as to details in the manner of using each. One of the most enthusiastic advocates of this treatment was found in Prof. Gustav Huguenin, of the University of Zurich. From a personal interview, and afterward from a written statement of his views and method, the following abstract is made and presented as a specimen of the most advanced doctrines.

He in substance says:

The treatment of typhoid fever without complications has become very simple since the introduction of the antipyretic therapeutics. Two principal remedies are used, viz., first the cool bath, and secondly the salicylate of soda, or the salicylate of soda with muriate of quinine.

The cool bath is used in the hospital at Zurich in *all cases*, light and severe. In light cases, when a rapid and thorough antipyretic is not so necessary, a bath of shorter duration is given. The temperature of each patient is measured *every hour*, and other conditions observed in the beginning, in order to ascertain the "run of the fever," which is very necessary, in order to judge of the way the salicylate of soda shall be given and the bath applied. In *Light Cases* the bath is given as soon as the temperature reaches 39.4° C. (102.2° F.), with a temperature of the bath from 12° to 15° C. (53.6°–59° F.) when the patient is robust, while if delicate and anxious, a temperature from 20° to 25° C. (68° to 77° F.) is used at the beginning, and cold water is added gradually until the temperature reaches from 16° to 12° C. (60.8°–53.6° F.), and the bath is continued from five to twelve minutes. It is often found necessary in more severe cases of the disease to give the bath when the body heat is 39°, or even 38.5° C. (102.2°–101.3° F.). With the bath the salicylate is given, and for this purpose, particularly, it is necessary to know the run of the fever, because the salicylate must be given before the temperature reaches its height.

In the second week of the disease the patient generally takes three grammes (forty-five grains) of the salicylate of soda in the morning, and the same dose in the afternoon. If the temperature increases gradually from four o'clock, so that at five it is 39° C. (102.2° F.), the bath is given, and it sinks to 38° or 37.8° (100.4°–100.2° F.).

In severe cases, particularly where delirium and sopor exist, the bath is given when the body is at 39° C. (102.2° F.), in very severe cases at 38.5° C. (101.3° F.), the temperature of the bath 12° to 15° C. (53.6° to 59° F.); and as often as the body heat reaches the above figures the bath must be repeated. It often happens that ten or twelve baths are required daily. In cases of coma, cold water is poured over the head from a height of about ten centimetres (four inches). To this treatment in some cases is added salicylate of soda, from eight to ten grammes (two to two and a half drachms) per day, from four to five grammes in the forenoon, and the same in the afternoon.

A mixture of salicylate of soda and quinine is often preferred—from seven and a half to fifteen grains of quinine with a moderate quantity of the salicylate. By these means the fever is very powerfully influenced in the severe cases.

Debility of the heart is not a contraindication either for the bath or the medicines. But when the debility of the heart is great, the patients receive, in addition, wine, in some cases as much as a litre (about two pints) a day, and sometimes, in addition, eighty to one hundred grammes (two and a half to three ounces) of rum or brandy with tea. Before and after each bath some wine is given, and during the bath the pulse and color of the skin are carefully watched. As to complications or particular symptoms, no form of delirium presents any contraindications, but, on the contrary, this symptom particularly calls for the antipyretic treatment.

Inflammation and stenosis of the larynx particularly forbid the application of cold water.

Lung complications, contrary to the opinion formerly entertained, are not considered contraindications. Bronchitis, Atelectasis, and Hypostatic congestion and inflammation are benefited by the cold water. Hemorrhage of the bowels is an immediate contraindication, but only so because of the danger to the ulcerated bowels by moving the patient in putting him into the bath.

Thrombosis of the crural vessels is regarded as a contraindication. The occurrence of nephritis is not a contraindication.

Prof. Huguenin says that the antipyretic treatment, not only in typhoid and typhus fevers, but in various other severe acute febrile and inflammatory diseases, demands experience and caution, but has a grand future.

From the statistics of the Cantonal Hospital of Zurich, in which Prof. Huguenin is physician, the mortality of typhoid fever has been reduced from twenty-seven to ten per cent. since the adoption of this thorough antipyretic mode of treatment; and he adds, "we have never had, up to the present time, one unpleasant occurrence from this treatment."

The testimony, not only here, but in the fever hospitals of London and elsewhere, is that a partial and vacillating use of these means is of doubtful utility, but that success attends the rigid and systematic following out of the course.

This method of treatment has been given in detail, as the success of any plan in any disease depends upon the faithful observance of the particulars of its essential features, and the practitioner who proposes to adopt it needs full directions as to all its details.

The disease as occurring in different localities and conditions may be differently affected by the same treatment; but in the range of my observation in the West I have no doubt of the beneficial action of quinine, properly used, as an antipyretic agent, in cases where the temperature is high in typhoid fever. The bath, the fever cot, or the cold lotions, judiciously used, will be important aids in the reduction of excessive heat.

Wider and longer experience may be required to establish the safety and full value of the *antipyretic method* as advised by Liebermeister and Ziemssen; but the testimony in its favor is constantly increasing, and is most positive from those who have been most thorough in its use.

Bed-sores are to be prevented first by the use of all the means possible to abate the severity of the fever, then by changing the position of the patient, relieving the pressure from the tender parts by cushions under the surrounding parts, by removing all wrinkles from the linen, by scrupulous cleanliness, proper bathing, and by spirituous or astringent washes; and when sores occur, they should be treated by relieving them from pressure, by balsam of fir, by carbolic acid and oil dressings, and by gentle galvanic currents.

After this account of the treatment of typhoid fever, and the various remedies which are applicable to its different conditions (so much extended in consequence of its exceeding importance), it remains only to state, in a summary manner, the general plan of treatment which in my judgment should be pursued.

At the beginning of the attack mercurials should be given, followed by laxatives, unless the diarrhœa is decided. If not so profuse as to be decidedly exhausting, the diarrhœa should not be checked in the early stage, or completely suppressed at any stage. Great care should be exercised in the selection and doses of the laxative, so as to avoid too violent and irritating effects in the sensitive and diseased condition of the bowels which is present. After this early eliminative treatment, the bowels should be kept open, when they are inclined to constipation, by the gentlest means, often by enemas rather than laxatives. If, as is generally the case, there is diarrhœa, the movements should not be entirely suppressed, but should be abated, when profuse and depressing, by the means mentioned.

If the condition of the bowels requires no special attention, if the fever be not above 102° or 103.5° F., and no complications be present, simple hygienic management, attention to food, cleanliness, ventilation, occasional sponging, etc., are all that will be required. The gentle diaphoretic and diuretic mixture, a formula for which has been given, will be well, and, as a rule, the use of some medicine will be more satisfactory to the patient and friends than none at all. When there is much diarrhœa, and especially tympanitis and tenderness, the turpentine emulsion should be given. It is often useful continued during a large part of the course of the disease. The special symptoms and complications are to be met by the means described. If the temperature rises to 104° and above, especially in the morning, and is nearly uniform, no marked morning abatements occurring, means should generally be resorted to for reducing the fever heat. The application of water by the bath, fever cot, or by sponging (in sponging vinegar and water may be used if preferred), should be systematically made, and if not sufficient to promptly reduce the heat, quinine or salicylate of soda should be given in such quantities as may be necessary to effect that object. My own experience indicates that seven or eight grains, and often less, repeated for a few times at intervals of two or three hours, will suffice to produce a remission. The quinine or salicylate of soda should then be omitted until its effects begin to pass off, when its repetition is called for.

The intermitted use of the antipyretic, in free doses, is much less likely to produce disturbing effects than its continued administration. It is much better to make a decided impression with it, and then suspend its use, than to continue it in smaller doses, when the object is to reduce temperature.

An account of the other means for fulfilling special indications need not be repeated. A single caution will be added. It is better not to apply remedies to every symptom that may seem to afford an indication, than to indulge in a polypharmacy. Much judgment and discretion are required in severe and complicated cases, in determining not only what is to be done, but what is to be abstained from.

The convalescence of typhoid patients should receive attention. The appetite, after a period of comparative starvation, and after the waste of the fever, is generally ravenous, and the self-government of the patient is in abeyance. The intestines have been ulcerated, and are still in the process of healing, and are therefore in a tender condition. Coarse articles of food, and much of any kind, may do fatal mischief. Bland articles and in moderate quantities must be directed, and obedience to directions must be insisted upon, and if necessary enforced. Lifting, straining, or other forms of active exertion should be avoided until the intestines have had time to become sound.

Typho-Malarial Fever.—When in a locality where malarial fevers abound a patient contracts typhoid fever, a modified form of disease is liable to be produced, which has received the name of typho-malarial fever. It is the result of the typhoid and malarial poisons operating on the system at the same time, and presents the mingled phenomena of typhoid fever and malarial fever. As these elements are mingled in different proportions in different cases, the symptoms are varied, and no description will apply to all.

The access is generally more abrupt and violent than in pure typhoid; the fever is constant, but is more violent at somewhat regular periods, and the specific typhoid lesions of Peyer's patches, of the mesenteric glands, and the spleen, are present, and the symptoms accompanying such lesions are more or less manifest.

As the disease occurred in the army in our late civil war, ulceration of the intestines beyond the usual limits of the common typhoid lesions, probably from a scorbutic condition, often occurred.

The course of the disease is variable, but, without treatment, is severe and protracted, and not unfrequently fatal. A protracted diarrhœa often follows it from a continuance of the intestinal disease; and functional and organic diseases of the liver not unfrequently occur. The treatment of this fever should be commenced by an eliminative laxative less active than in malarial fever, in consequence of the intestinal disease, and then full antimalarial doses of quinine, as in remitting fever, should be given. This will neutralize the malarial element, when the remaining fever should receive the same treatment as a simple typhoid presenting similar phenomena. The free doses of quinine here, as well as elsewhere, will abate the feverish heat at the same time that they neutralize the malarial poison, though fever will return again more or less actively until the typhoid condition has run its course. It is unnecessary to enter into details, as the principles of treatment are the same as those which have been so fully discussed in the preceding pages. Some physicians, among whom is Prof. Bartholow, question the existence of this fever and the propriety of applying to it a distinctive term, giving as a reason the existence of the specific typhoid lesions; but the presence of such lesions, and of the special typhoid element, does not necessarily exclude the malarial. Both influences may operate on the system at the same time, and this is certainly sometimes the case; and when so, the term typho-malarial may with propriety be applied to the resultant phenomena.

TYPHUS FEVER (EXANTHEMATOUS TYPHUS).

This has been defined, "a highly contagious fever, lasting from two to three weeks, and attended with a characteristic measly eruption, coming on from the fourth to the seventh day." (Bristowe.)

The fact that until very recent times typhus and typhoid fevers were not distinguished—that in all but the last edition of the classical work of Sir Thomas Watson, on the Practice of Medicine, a present living authority, they were described as varieties of the same affection—indicates that they must have much in common, and that many of the principles discussed in the article on Typhoid Fever are equally applicable to this affection. This will prevent the necessity of so extended a consideration of typhus as has been given to typhoid fever, and we shall therefore only need to dwell upon the points in which the two diseases differ.

Typhus is not as widely distributed and frequent in occurrence as typhoid fever. It is mostly confined to temperate climates, and it is doubtful whether it has ever occurred in tropical countries. It has occasionally appeared in all the countries of Europe, in our own country, and Canada; but its particular home is in Great Britain, and it has raged in Ireland more than elsewhere. It is, doubtless, like the typhoid, dependent upon a particular specific poison; but the poisons of these two forms of fever differ in their characters, and in the conditions of their production and spread.

While the typhoid poison has it habitat, chiefly at least, in fæcal filth, the typhus germs are particularly connected with the filth arising from emanations from human bodies when crowded together in numbers in unventilated and uncleansed apartments. The same question exists as to the spontaneous production—the evolvement anew of the germinal matter without preceding germs of the same character—as in the case of typhoid. Murchison contends, with a great array of facts and much force of argument, for the production *de novo* of the specific material under the influence of *crowding, filth,* and *famine;* and he is sustained in this view by the opinion of Jaccoud, Grisolle, and others. This poison must have had a beginning at some time, and the same conditions first producing it may do so at any time again; but it is impossible to show in any given case of an outbreak of the disease, however remote in space or time from other cases, that there were no latent germs brought into productive activity by favorable conditions. Under these circumstances the question must still remain open. But the important practical fact is, that typhus fever commences and spreads only from places where crowding and filth are present.

That the poison, however originating, is multiplied in the bodies of the sick, and is communicated from them to others admits of no doubt.

Commencing in crowded prisons, in the holds of emigrant ships, or the cellars, garrets, or cabins of the poor, it spreads by contagion to others—sometimes to the palaces of the rich, the judges of the courts, and too frequently to the physicians and nurses in attendance upon typhus patients. It is quite as likely to prove severe and fatal among the intelligent and well to do, when it attacks them, as among the ignorant and poor, the brain symptoms being more prominent among the intellectual and cultivated than among the rude and ignorant.

It has so often accompanied poverty and famine, because these conditions lead to crowding and depression. It has seldom appeared in the Western States, and never, in my experience, except where it could be traced to recent emigrants from Europe; and it has never had, in these localities, any wide-spread prevalence.

It essentially differs from typhoid fever in having no constant and specific internal lesions—particularly it differs in the absence of the disease of Peyer's patches and the mesenteric glands—the internal lesions which occur being accidental rather than necessary, and mostly within the cranium and thorax. These lesions, particularly of the brain, are more frequent in typhus than in typhoid, and consist, as in cases of typhoid where these organs are affected, of congestions, inflammations and their consequences, of hyperæmia, effusions, softenings, etc.; and the degenerations are similar to those that occur in the last-named disease.

The eruption, as already stated, is peculiar and characteristic, and is more frequently present and abundant than in typhoid fever. From its comparative constancy and abundance, it has suggested the name of Exanthematous Typhus, and, from its dark color, of Petechial Typhus.

It embraces two factors—a mere mottling of the surface and distinct dusky red spots. These are usually present at the same time, though the mottling precedes the development of the more distinct rash. The mottling is produced by the appearance of abundant, illy defined patches, not elevated, and disappearing on pressure, the individual points being scarcely perceptible. The rash resembles in appearance that of measles. The spots, however, are smaller and less elevated, and do not so frequently assume a crescentic form. They are slightly raised, fading at the margins. At first, while they have a brightish color, they disappear on pressure, as they are produced by the stagnation of blood in the capillary vessels; but after a few days, owing to effusion of the coloring matter of the blood into the tissues of the skin, they become darker, and the color is not removed by pressure. After some days they fade away, or blood corpuscles are effused, and they are converted into petechiæ, which are more permanent. More or less of this eruption is almost invariably present; but it is less abundant, and of shorter continuance, in children than in adults.

The rash is generally in proportion to the severity of the fever, and a free amount of petechiæ, which sometimes occurs in the latter stage of the disease, is regarded as an unfavorable indication. The eruption, then, is both a diagnostic and prognostic sign, and is therefore worthy of careful attention.

The action of the heart is rather more inclined to be weak, and to fail, than in typhoid—the first sound becoming inaudible, or decidedly less than the second. Symptoms referable to the nervous system—delirium, subsultus, etc.—and death by coma occur at an early period more frequently in typhus than in typhoid fever.

"Coma vigil," or the condition in which the patient lies with the eyes open, but nearly or quite devoid of sense, is more frequent in typhus than in typhoid.

Typhus varies much in severity, and is sometimes so slight, and of such short continuance, as to render diagnosis very difficult unless aided by the surrounding circumstances and the prevalence of the disease. Owing to the absence of the abdominal lesions and the dangers attending them, the mortality in young persons is less than in typhoid; but it increases rapidly in adult life, so that between fifty and fifty-five, according to the statistics of the London Fever Hospital, the mortality is very nearly fifty per cent., and between seventy-five and eighty it is about eighty-five per cent. On the whole the mortality does not materially differ from that of typhoid fever.

The full development of typhus fever is very generally preceded by prodroma—by pain in the head, neck, back, and limbs, by anorexia, restlessness, etc.—lasting a few days, more or less, when the fully developed access somewhat suddenly occurs.

At the full onset there is usually a chill, which is possibly repeated. The fever comes to its height sooner than in typhoid; the temperature is often speedily raised to from 103° to 106°, and oftener than in typhoid it reaches higher figures, from 106° to 109° F., and the surface frequently gives to the hand a burning, tingling sensation, which has caused the name of "calor mordax" to be applied to this peculiar heat. The muscular weakness in severe cases is great; there is generally a dusky or smoky color of the face, and an expression of profound apathy. The heat is generally quite evenly distributed over the body, and there is less difference of temperature between morning and evening than in typhoid. The pulse is commonly rapid, often from one hundred and twenty to one hundred and forty, and there is an ammoniacal or cadaveric odor, differing from that of typhoid.

The fever usually continues from thirteen to eighteen days, when, in favorable cases, the temperature commonly falls rapidly, coming to the normal standard in twenty-four hours, more or less.

In unfavorable cases, the fatal termination is most frequently about the end of the second week or the beginning of the third, and is commonly due to a combination of asthenia and coma. When it occurs at an earlier period it is often produced by congestion of the lungs, in addition to the other pathological conditions, and when much later, it is caused by some complication or sequel of the fever, as in an uncomplicated case the crisis is already passed, the fever subsiding within sixteen or eighteen days.

The chief condition distinguishing typhus from typhoid is the specific abdominal lesions in the last, and their absence in the first. But in comparing them in various aspects, the following summary of differences will be recognized:

Typhoid.	*Typhus.*
Access slow.	More rapid.
Heat somewhat less, and varies more between night and morning.	Heat higher and more uniform.
Mind less disturbed at the early stage.	Delirium, stupor, and other nervous symptoms earlier and more constant.
Disease of Peyer's glands, etc.	None.
Diarrhœa and tympanitis.	Absent.
Emaciation greater.	Less.
Epistaxis often.	Seldom.
Cutaneous eruption less abundant, less constant, lenticular, and rose-colored.	More dark, diffused, and irregular in form.
Essential pathological lesions.	None.
Accidental lesions the result of fever similar, but less of the brain.	More of the brain.
Less contagious.	More contagious.
Caused by germs mostly in fæcal filth.	Caused by germs mostly in crowd filth.
Duration longer.	Duration shorter.
Defervescence slower.	More rapid.

TREATMENT.

The preventive management in typhus, as in typhoid fever, is of the greatest consequence, and in this, as in other diseases, consists in avoiding the causes.

Personal cleanliness and thorough ventilation, with proper food, are the great hygienic preventive measures; and when the disease actually occurs, as it is so positively contagious by the effluvia that emanate from the sick, they should be isolated as much as possible, and the freest and most perfect ventilation of the sick room must be especially insisted upon; the clothing and everything near the patient capable of absorbing the poison should be often changed, disinfected by heat or chemical agents, or burned.

The room should be disinfected, and, in short, all the means to prevent personal contagion, or the carrying of the poison and its spread in fomites, should be sedulously used. As in typhoid fever, one attack confers comparative though not perfect immunity from subsequent ones; if possible, it is well to select as attendants upon typhus patients those who have had the disease, and young persons, if not protected, rather than old, as it is so much less dangerous with the young.

The curative treatment is substantially the same as in typhoid fever, aside from the indications presented by the specific conditions of the abdominal organs and their consequences in the latter.

There is no known specific remedy which can be relied upon to neutralize the poison and arrest the disease; but there are the same indications for eliminating effete matter, the result of the feverish waste, and for abating the excessive heat, relieving distressing symptoms, and finally, for sustaining the rapidly diminishing strength. The means for accomplishing these objects are also substantially the same as those employed in typhoid fever.

Eliminative laxatives should be used in the early stage, and the bowels must be kept open throughout, and though there is less danger of cathartics irritating the intestines and operating profusely than in typhoid, there is quite as much necessity for avoiding debilitating effects from their excessive use. The kidneys should be gently excited to carry off the effete matters as well, and the skin, as another emunctory, should be kept as active as possible by means which will do no harm in other respects. The diaphoretic and diuretic mixture of acetate of ammonia, spirits of nitre, and syrup of ipecac. will be applicable here, as also the effervescing mixture of cream of tartar and bicarbonate of soda, the chlorate and other salts of potash and similar articles as in other fevers.

The mineral acids are favorites with some, but, like all other medicines having any local irritating properties, should be largely diluted. As adynamia and exhaustion are characteristics of this fever, the alimentation must be carefully attended to; and the same questions arise concerning the use of tonics and stimulants as in typhoid. As to the use of alcohol, opinions here differ, as in the other fever; but it is now generally agreed in England and Ireland, where the fever most prevails, that alcohol is not necessary in the ordinary cases, and especially in the earlier stages of the disease; it is still, however, used by many in the latter stages where there is great depression, especially when the heart fails, and its first sound becomes much feebler than the second. When used, the same rules should be observed as laid down for typhoid fever.

As to the use of the bath and quinine as antipyretic agents, experiments have not been made on the same large scale as in typhoid cases, but I can see no reason why these agents are not equally applicable in the one case as in the other. But here, particularly, the test of experience has not been sufficient to determine the full value or dangers of the rigid antipyretic method.

The complications and the particular distressing symptoms are to be managed on the same principles as the same conditions in typhoid fever. As there is a greater tendency to congestion and inflammation of the brain and to coma in typhus than in typhoid fever, more caution is required in the use of opium, and the bromides are more frequently called for.

The full account of the treatment of the conditions common to typhoid and typhus fever, given in the article on the former disease, renders any further details unnecessary.

RELAPSING FEVER.—FAMINE FEVER.

This is a peculiar contagious disease originating in famine (but less dependent upon filth than typhoid or typhus), in which a fever rapidly comes on, and attains a high temperature, continuing about a week. It then disappears, the temperature sometimes falling decidedly below the normal; and generally all the conditions improve for about a week more, when the fever returns and continues for another week, after which it again disappears; though it occasionally reappears a third, or very rarely even a fourth time after similar intervals. The patient then enjoys a period of exemption, which in some cases is permanent, while in others the liability to attacks on exposure to the contagion in time returns.

So far as I am aware this fever has never had an outbreak in this country, except when the contagion was brought from abroad; and it has prevailed more in Ireland and England than elsewhere.

It is so rare in Paris that the works on the Practice of Medicine by Grisolle and Jaccoud do not mention it, and it might be passed by here as a disease not likely to come under the observation of American physicians, were it not that there are some very interesting recently discovered facts connected with its pathology, which throw light upon the whole subject of specific contagious or infectious diseases.

It recently, however, prevailed in Russia, and was introduced from that country into Germany, where it was frequently observed in the hospitals in the summer of 1880.

It has no necessary lesions that have been recognized, unless it be enlargement and softening of the spleen. The liver is also enlarged, though not uniformly; but these conditions occur in other affections as well.

In 1872, Dr. Obermeier detected in the blood of patients with relapsing fever a form of bacteria called "spirilla." They are moving spiral filaments of extreme tenuity, measuring from $\frac{1}{1600}$ to $\frac{1}{800}$ of an inch in length. They appear in the blood in great numbers just before the rise of temperature or the access of the fever; continue while the fever continues, or rather they disappear just before the crisis of the week's paroxysm of fever occurs. They again appear just before the next septenary access, disappearing again at the time of the next crisis. These observations have been repeated, so as to leave no doubt of the connection of these spirilla with the fever as a cause. They vary in number during the fever, and from the observations of Dr. Heydenreich, of St. Petersburg, it appears that the spirilla are short lived, especially at fever heat, and that their varying quantity in the blood during the fever is due to the occurrence of successive germinations. The contagious character of this fever is established by many observed facts; and it is rendered exceedingly probable that the spirilla constitute the contagium, by the almost crucial experiment of inoculating with the blood containing these bodies, and thus producing the disease; while inoculating with the blood of the same person during the intermission of the fever, when these bodies are not present, fails to produce it, as also does inoculating with any of the secretions.

These facts resemble those observed in the Milzbrand, or Anthrax, or splenic fever of cattle, already referred to, and which is sometimes conveyed to man.

The recently discovered facts of these cases are wonderfully confirmatory of the *germ theory* of infectious diseases, and the actions of microzymes as the cause of their phenomena.

The question as to whether these spirilla, so connected with the phenomena of relapsing fever, are produced anew by famine, or whether the germs are hidden in ordinary conditions, and brought into activity and multiplied by the peculiar conditions of privation, is not determined. This involves the question of spontaneous generation, and the fixed character of organisms; but from all the knowledge at present possessed, it seems probable that these organisms, in some stage or form of their life, have a continued existence, but that certain circumstances favor their rapid production, and their existence in sufficient abundance to cause the morbid effects. That a poison is multiplied in the body during the disease, and is communicated from the sick to the well, is fully established; and this constitutes relapsing fever a genuinely contagious disease. It seems, however, that the poison is not very diffusible—that it lingers about the person, is capable of being communicated by fomites, but that a considerable amount of exposure, remaining some time in the presence of the sick, and receiving a considerable quantity of the poison, is ordinarily necessary to the production of the disease, especially in those not suffering from want. Thorough ventilation and other prophylactic precautions generally prevent its spread.

The period of incubation of the poison varies, but is generally rather shorter than that of typhus.

The onset of the disease is commonly sudden. It is marked by chilliness or rigors, and by severe pain in the forehead, trunk, and limbs. Intense heat and dryness of the surface soon follow, with continuance of the pains and with giddiness, frequency of pulse, loss of appetite, etc. Perspirations sometimes alternate with dryness; occasionally the general symptoms continue only for three or four days, but generally for seven; when, often preceded by a slight rigor, a free perspiration breaks out, lasting for a few hours, is followed by a remarkable reduction in the rate of the pulse and the temperature, and, with the exception of some lassitude, with almost complete restoration to health.

During this paroxysm the fever ranges from 104° to 108.5° F.; the pulse from 110 to 140; the tongue has a thick, whitish fur, with red tip and edges; and, occasionally, toward the end of the paroxysm, is dry and brown. There is extreme thirst; sometimes vomiting; and, in rare cases, slight hæmatemesis; the bowels are generally constipated; there is often tenderness in the region of the liver and spleen, and, as before stated, these organs are more or less enlarged; and in many cases, about the third or fourth day, there are some icterode symptoms.

The urine varies in quantity, but, as in other fevers, generally contains an excess of urea, and occasionally is albuminous, and even bloody; and, toward the close of the attack, suppression in rare cases takes place. The general pains in the body continue severe, and are sometimes largely in the joints, as if from rheumatic poison. For the most part the patient retains consciousness, but suffers from sleeplessness or broken and dreamy slumbers. Delirium, however, sometimes maniacal, occasionally occurs near the crisis; and in rare cases stupor, coma, and even convulsions have occurred, probably due to uræmic poisoning.

There is not generally the congested, smoky, dull, puzzled aspect of typhus, and this difference is one of the means of distinguishing it from that affection. At the crisis the perspiration is occasionally accompanied or replaced by a diarrhœa; and in still rarer cases a hemorrhage from the nose, bowels, or elsewhere, occurs. There is no specific rash belonging to this disease; but rarely, near the crisis, a petechial eruption appears.

The temperature during the intermission may sink below the normal, even from 96° to 90.6°; and the pulse may become as low as from 60 to 40 in a minute; though, from the weakness, it is liable to increase on exertion. The tongue commonly becomes clean, and the appetite is often voracious. Very rarely the patient, at the period of crisis, falls into a collapsed or typhoid condition; but almost uniformly, after the fever abates, he is soon restored to a comparatively healthy state. This, in rare cases, is permanent, the attack, as described, being the only one; but generally, at the end of fourteen days, more or less, from the first attack, another ensues in almost precisely the same manner, and generally pursues a similar course, though the temperature is sometimes higher, and the paroxysm is often somewhat shorter. It may not continue for more than three days before final convalescence occurs, with the same phenomena as before. Other paroxysms, as before stated, may occur, but such cases are rare.

The danger to life from this fever is slight. There are usually no severe local lesions; the fever, though high, can be endured for the shorter period of a week, and, during the intermission, the system has time to recuperate and gain the ability to endure the next paroxysm.

Even among the poor and famished patients of the London Fever Hospital, the mortality shows only 4.75 per cent. The causes of death, when it occurs, may be from asthenia, collapse at the crisis, or from coma and other cerebral complications; also, from implication of the kidneys and retained urea.

Complete convalescence is often protracted, the full strength not being soon regained; but sequelæ of a serious character seldom follow. Occasionally, however, pulmonary affections, as a low form of pneumonia, or a diarrhœa or dysentery, may supervene. An ophthalmia is not unfrequent, and is somewhat characteristic.

Pregnant women almost invariably miscarry, at whatever period of gestation, when this fever occurs with them. The fœtus, as a rule, dies, but the mother as generally recovers.

Lesions of accidental complications are sometimes found on post-mortem examination; the liver, as before stated, is often congested and enlarged, but otherwise apparently healthy; but the spleen is almost invariably much increased in size, is soft, and sometimes diffluent. This organ, so constantly affected in malarial, miliary, and typhoid fevers, seems peculiarly susceptible to a morbid impression from all fever poisons.

How the germinal poison of relapsing fever causes the peculiar phenomena described is entirely unknown, and, indeed, it is not absolutely demonstrated that such germs are the cause of the phenomena—they may possibly be accidents only—but the strongest probability exists of an essential causal relation, and a conviction to that effect is well-nigh irresistible.

Treatment.—After what has preceded, the subject of the treatment of this fever may be briefly disposed of. The means of prevention are at once suggested. Providing the people with food and fuel in cases of destitution; and as prophylaxis, when the disease has broken out, isolation of the sick, thorough ventilation and cleanliness; and as the contagion is generally communicated through the air, the use of antiseptic vapors, such as chlorine, iodine, and sulphurous acid in the sick room and about the patient is demanded.

As there are no known means of arresting the course of the disease, the use of palliative treatment for relieving symptoms and preventing or modifying complications, is the course to be advised.

Undoubtedly gentle eliminative measures—laxatives, diuretics, and diaphoretics—will be useful; the excessive heat may be abated by cold sponging, or the bath; the vomiting may be allayed by ice, effervescing mixtures, or anodynes; the headache may be abated by cold applications to the head, by bromide of potassium, and often, especially if sleeplessness is present, opiates may be added; and if coma, with suppression of urine be present, more active eliminative cathartics, such as the salines, or cream of tartar and jalap, with the application of cupping glasses to the lumbar region, the warm bath, and perhaps the jaborandi may be required.

Emetics, given in the early stage, have been thought by some to render the disease milder, while bleeding, here as in other active fevers, has had its advocates; and cases of congestion can be conceived of where this latter remedy may be useful.

Experience, so far as I am aware, has not determined the effects of quinine or salicylate of soda in this fever in controlling the heat or other symptoms.

During the attack the food should be such as is proper in other similar diseases, and alcohol should be avoided, except perhaps in cases tending to collapse, or under the conditions already indicated in other fevers.

In our own country, with such an extent of territory, variety of products, and abundance of food, we need not fear, for a long period to come, the occurrence of famine, and the consequent origination of this malady. In case of threatened importation, quarantine regulations should be enforced, as against other contagious diseases.

Irregular forms of fever are sometimes met with, not answering to the description of any of the well-known types which have been described. In a majority of cases they more nearly resemble typhoid than any other of the specific fevers, but they have peculiarities, depending upon seasons and localities, and perhaps upon different kinds of poisons.

Cases of this kind have been reported from different localities, but not always with sufficient accuracy and fullness to give just notions of all their peculiarities. Some of the unique specimens may not be repeated, so that a description of them is less important; and, besides, the same general principles of treatment are applicable to them as to the fevers already described. The fevers which occurred in some portions of our army during our late civil war, and which received the name of typho-malarial—fevers which certainly did not present in all of their phenomena the ordinary types of either typhoid or malarial fevers—serve as an illustration of the modifying influence of particular circumstances, or the different character of the poison producing the fevers.

In the management of such fevers the general principles so fully dwelt upon must govern, while the results of experience in the prevailing cases must not be neglected.

PLAGUE (PESTILENTIA).

The Plague is a contagious fever, in some respects resembling typhus, but is distinguished from it by the absence of the peculiar rash of the latter, and by the presence of buboes, carbuncles, and gangrenous pustules.

It is known to have prevailed from at least an early period of the Christian era in Asia Minor and surrounding countries, where it still lingers, and it has spread from its seat, at various times, over the Continent of Europe. It last appeared in England in the great plague of 1665, and has since not unfrequently spread as an epidemic beyond the bounds of the countries where it ordinarily exists. It has had no considerable prevalence in Europe within the experience of any of the present generation; in 1878–9, however, there was an outbreak that spread into Russia and threatened and alarmed all Europe, but was suppressed by vigorous sanitary measures.

The conditions which favor its occurrence are the same as those which determine that of typhus—privation, filth, and overcrowding—and it is apt to attack armies and the inhabitants of beleaguered cities. It has never prevailed in America, and as its strictly contagious character is so well understood, it is hoped that proper quarantine and sanitary measures will be so constantly enforced as to free us from such a calamity.

A degree of protection against subsequent attacks is produced by its occurrence, yet this is by no means perfect, as it has often occurred more than once in the same person.

The contagion is communicated by the breath, by contact, by inoculation, and by fomites. In its late outbreak in Russia it was said to have been brought by a soldier in some article of clothing—a sash or shawl—taken from the dead body of a Turk during the late Turco-Russian war.

The duration of incubation is uncertain. The symptoms are chills, rise of temperature, pain in the head, back, and limbs, giddiness, anxiety, and sickness, soon followed by great loss of muscular strength, great feebleness of the heart's action, with a small, rapid, and irregular pulse, and great general prostration. The countenance is markedly dull and stupid in its expression, delirium and coma generally soon following, and sometimes convulsions and speedy death. The tongue, thickly coated from the beginning, soon becomes dry and black, the bowels are apt to be loose, the urine scanty and sometimes suppressed, and hemorrhages from the mucous surfaces not unfrequently take place.

Within two or three days from the onset, petechiæ may or may not appear upon the surface, but characteristic swellings of glands in the groin, axilla, and neck appear; and somewhat later carbuncles are developed in different situations, mostly on the extremities. The buboes enlarge and reach their height in eight or nine days, in case of so long survival, when they usually subside, but sometimes suppurate. The carbuncles are far from being constant; they vary in size and intensity of inflammation, and in numbers from one to a dozen.

Death may take place within twenty-four hours or may be delayed for several days, and sometimes until the second or third week; but the specific disease before that time has expended its force, and those who die so late probably succumb to some of the complications.

Before the buboes or "plague spots" appear, it is regarded as impossible to distinguish plague from severe typhus; but the buboes, though in rare cases occurring in typhus, are much more frequent in plague; the typhus rash, which, however, does not occur till after several days, is absent in plague; and the greater and more speedy mortality in the latter disease will soon distinguish it from the former.

Post mortem, there is a tendency to rapid decomposition; the blood is imperfectly coagulated; there is congestion, enlargement, and frequently softening of internal organs, often extravasation of blood in points beneath the mucous and serous surfaces, and swelling not only of the external lymphatic glands, but of those within the abdomen and thorax, some being as large as a goose's egg, while others are smaller; and they may have undergone softening and sometimes suppuration.

The preventive treatment of plague, which is infinitely of most importance, consists in avoiding the causes, in isolation, and the strictest quarantine. In the late outbreak in Russia, the inhabitants of villages where it appeared were removed from their homes and placed under the strictest military guard, and often their villages were burned; a military cordon surrounded the whole infected region, and neither egress nor ingress was allowed.

The *curative treatment* is entirely unsatisfactory. No specific remedies are known, and the principles of the treatment applicable to it are those appropriate to severe typhus fever. The local treatment of the buboes, carbuncles, and sphacelations should be emollient rather than irritating, as for similar affections under other circumstances. While experience has not as yet proved the special efficacy of any measures, we should not despair of finding in the future some means for combating even so frightful an affection.

DIPHTHERIA.

ANGINA MALIGNA.—CYNANCHE MEMBRANACEA.—PUTRID SORE THROAT.—EPIDEMIC CROUP.

This is an acute, specific, infectious, and contagious disease, generally prevailing epidemically. It is a general disease affecting the whole organism, but with peculiar local symptoms produced by a specific inflammation, chiefly of the fauces, nares, larynx, and trachea, which results in the formation of a characteristic membrane on these surfaces, resembling a skin or parchment, and giving the disease its name.

The general phenomena are marked by a form of fever, in which there is a rapid development of anæmia and extreme debility—the evidences of severe blood poisoning.

Its dependence upon a specific poison is proved by numerous facts, and its contagious character is demonstrated by its production by inoculation with the matter of the membrane. It is generally, however, communicated through the atmosphere, and the poison must therefore be capable of volatilization.

From the fact of its being communicable by inoculation, some have regarded it as primarily local, becoming general from the local change; while others, with at least equal reason, knowing its communicability through the air, and often observing general symptoms before the local changes are manifested, consider its primary condition general, and the local lesions secondary. I see no inconsistency in regarding it as sometimes primarily local, and at others as primarily general. But the important fact is, that, as it presents itself for treatment, it is both a local and a general disease. The diphtheritic exudate is not absolutely confined to the throat or mucous membrane. It sometimes appears on wounded or excoriated surfaces which may happen to be present in a diphtheritic patient. It is of a whitish or grayish color, has sometimes sufficient coherence to admit of being removed by forceps in large patches, while at other times it is more tender and diffluent. When the membrane is tough, it is found to be fibrinous; when more flocculent and tender, it is chiefly composed of greenish corpuscles, pus, epithelial cells, and blood corpuscles mingled together.

Many low vegetable organisms—bacteria, micrococci—have been found in this membrane; and Oertel, Heuter, and others, who have studied the disease with care, assert that these bacteria are not only in great abundance in the membranous exudate, but also in the lymphatic spaces of the subjacent corion, and more or less in other tissues; and these observers believe them to be the essential contagious material. Whether this is so, or whether their presence is accidental and occasional, rather than constant and essential, is not determined, as some observers, of perhaps equal authority, have sought for them in some cases unsuccessfully. That the poisonous material is in the membrane and the living parts beneath it, and from which it springs, whatever its form, or whatever else it may be, cannot be doubted; and that it may be absorbed from the diseased surfaces, affecting still further the system, is supported by sufficient evidence upon which to base pathological conclusions and therapeutical indications.

This peculiar disease, although it has existed and been described at periods since ancient times, was unrecognized for the last few generations as a distinct affection until observed by Bretonneau, of France, and described in his treatise, in 1826. Since then it has spread to a considerable extent over Europe and America, prevailing extensively in France from 1855 to 1857. It was apparently imported from thence into Great Britain, where it committed great ravages from 1859 to 1862. It first appeared in this country in California, in 1857, and has since made its appearance in innumerable places throughout the country, prevailing in different localities more or less epidemically, and in a greater or less severe form, up to the present time. Whether or not the poison was an importation into this country, it has become indigenous, and has desolated many households throughout the land. It has prevailed at all seasons, and affects both children and adults, but is more common among young children, especially between the ages of three and six years, and is more fatal with them than with older persons. From observations carefully made, it is found to occur more frequently, and prevail more extensively, in localities and dwellings where filth prevails and the general sanitary conditions are bad; but the contagion is sometimes effective in localities considered healthy, and in what are regarded as sanitary households.

The contagion is not only carried directly from the sick to the well in the air, but may be communicated through fomites, where it may lie dormant and preserve its vitality for considerable periods before finding favorable conditions for its development and effects. Its inoculability is generally conceded, Oertel and others stating that they have often produced the disease in rabbits by introducing diphtheritic matter into the trachea; but the reports of others, of experiments upon the lower animals, have not been so conclusive. It is said that Trousseau and others have inoculated themselves without effect; but a few, or even many such failures, by no means prove that with others the poison may not take effect. Many persons are incapable of being affected by various diseases unquestionably contagious and inoculable. However much exposed, many fail to take typhus fever and scarlatina as well as diphtheria.

The disease is most likely to be communicated in its active stage; but patients, after convalescence, are believed to be capable of communicating it for two or three weeks.

The period of incubation varies, it is thought, from a few hours to seven or eight days.

The invasion varies in its abruptness and the intensity of the earlier symptoms, even when the ultimate result is the same. In very many cases there is at first but a moderate febrile excitement, with debility and languor, and but a slight feeling of uneasiness in the throat. This is often so slight that the patient makes no complaint of any local symptoms, and admits only a sense of languor and depression. If an adult, he may continue his ordinary pursuits; and if a child, may simply mope. There will be pallor and a dull expression; and, when examined, the throat will be found to present some points of moderate redness, which will gradually extend, and at length running together, will present a more continuous and deeper red appearance. Now certainly, and often nearly as soon as the redness begins, a whitish exudate will be seen, at first in patches and filmy; but soon spreading and becoming thicker, the characteristic skinny or parchment appearance is presented, often resembling dirty wash-leather. It may be confined to the fauces, or it may spread over the whole mouth into the nares, and too frequently into the larynx and trachea, and sometimes into the bronchi, even to their minutest ramifications.

While this is going on the general and local sufferings increase in severity and gravity, evidences of blood poisoning present themselves, and a fatal depression may come on; but more frequently the immediate cause of death is suffocation, produced by the swelling of the mucous membrane of the air-passages, and especially by their obstruction from the false membrane.

A more complete account of this important disease is required, and will be afforded, by a description of the leading varieties met with. These, as observed in different epidemics, and in different cases in the same general prevalence, are as follows:

1. Mild diphtheria.
2. Inflammatory.
3. Insidious.
4. Nasal.
5. Primarily laryngeal.
6. Secondarily laryngeal.
7. Asthenic, adynamic, or malignant.

1. Generally, when the disease is prevailing, a certain number of cases of the first variety will occur. The patient, with but little fever at any time, with scarcely any complaint of the throat, and only a slight feeling of indisposition, may have no occasion to take to his bed, or even to desist from his ordinary occupation. He has, however,

some redness and a slight swelling of the mucous membrane of the throat, particularly of that part covering the tonsils, and often some swelling of the bodies of those glands. With this there may or may not be some patches of membrane, and when present they are commonly thin and filmy, though occasionally thicker; but whether thinner or thicker, they are in small patches, are on the tonsils and pillars of the fauces, and disappear in a few days spontaneously, and may be hastened in their disappearance by proper treatment. These milder cases swell the percentage of recoveries, and often inspire great confidence in remedies which in severer cases are quite ineffectual.

2. The second, or inflammatory variety, is much more violent in its phenomena and serious in its consequences. The onset is more abrupt, there is pain in the head and other parts of the body, often rigors and a higher grade of fever; but the more distinguishing feature of this variety is more deep and decided inflammation of the throat and glands of the neck, with more development of the usual symptoms of heat, redness, pain, and swelling than in other forms. The swelling about the throat and neck, involving not only the glands but the general tissue, is sometimes great, seriously interfering with deglutition and respiration ; and inflammation and swelling in some cases occur in the sockets of the eyes and in other parts. The false membrane here forms upon the mucous surface of the throat as in other cases ; but the inflammatory swelling is much greater than in the ordinary or less inflammatory forms of the disease, constituting this a distinct variety, or presenting what may be called a complication.

3. The insidious variety is not uncommon. The symptoms at first are but little pronounced ; there is no complaint made of the throat, the temperature is but slightly elevated, the patient is rather dull, and perhaps mopes, the appetite may be impaired but not lost, and the patient may not take to his bed or be confined to the house for two or three days ; but at length symptoms of more severity occur, particularly prostration of strength ; the membrane may or may not be excessive, but the most profound symptoms and a fatal result may follow in a few days. In some cases where the symptoms are in the earlier stage more severe, marked abatement of them takes place ; but the hopes excited are not realized, severe symptoms before long returning, and a fatal issue following.

4. In this variety the membrane sometimes forms primarily, or very early, in the nares, but more frequently it extends from the fauces to the Schneiderian membrane ; and when occurring there, the absorption of poisonous matters by that delicate and vascular surface is likely to be so great that the danger to the patient is much increased ;

and this is therefore regarded as a well-marked variety of the disease. Blood poisoning, adynamia, and depression in a fatal form are apt to follow.

5. The primary laryngeal variety is not common, and may be confounded with non-specific croup. When it does occur, the croupy cough, cooing respiration, and great dyspnœa will early appear, and in children especially, suffocation may soon result.

6. The secondary laryngeal and tracheal variety, or that form where the specific inflammation and formation of the membrane begins above, and extends into the larynx, trachea, and occasionally into the bronchi, is much more common. In a majority of fatal cases this is the form of the disease; and though blood poisoning and great depression commonly exist, and might of themselves prove fatal, yet suffocation is the direct cause of death. These are the cases which so often embarrass the physician, and which raise the question of tracheotomy or other mechanical interference.

7. Malignant cases, or those where from blood poisoning extreme depression and speedy death occur, sometimes without much development of local symptoms, are much more frequent in some localities and epidemics than in others; but they are not uncommon where the disease extensively prevails. The cases bearing this name are, however, not well defined, as the term is also applied to nasal and other varieties, where great depression and speedy death result.

From this sketch of the different forms which the disease assumes, it will be observed that special phenomena present many varieties, and indeed there are peculiarities of individual cases which no distinctive classification will designate. Sometimes, in severe cases, the membrane will be comparatively slight and filmy, while in others the fauces and mouth will appear as if covered over with a thick paste, or a coating of plaster of Paris, more or less dingy.

The exudate is generally superimposed upon the inflamed mucous membrane, rather than sunken into depressions of its surface; but occasionally superficial ulcerations occur, and when the exudate is removed slight ragged depressions will be seen. Very rarely more extensive destruction of tissue occurs, and sphacelation is possible; but the offensive odor so common, especially toward the latter stages of the disease, arises from the decomposition of the exudate, and not from sloughing of any of the proper tissues. When undergoing this decomposing process the diphtheritic membrane generally becomes darker in color, and more or less pultaceous or diffluent.

In the inflammatory variety suppuration sometimes, though rarely, occurs in the tissues of the neck, and also rarely in the swollen tonsils. When suppurative inflammation occurs upon the surface of the mucous membrane, it tends to the separation of the exudate, and the prevention of the absorption of poisonous matter from it, and therefore this process should be encouraged.

The temperature in diphtheria varies so much that no special degree can be regarded as characteristic. It may be very little above the normal in severe and fatal cases, and yet in some cases, especially where the larynx and trachea are the seat of the disease, the temperature may rise to 106° or 107° F., and even more.

The urine is febrile, and in one half or more of the cases is albuminous, and presents hyaline casts; and occasionally it is bloody. These conditions are usually of short continuance, and are seldom followed by dropsy or uræmia, or by permanent lesions of the kidneys. The mind in diphtheria is generally clear, excepting in the last stage of fatal cases.

The duration of the disease varies very much, both in the favorable and unfavorable cases. Death may take place within twenty-four hours, or may be delayed for two weeks—very rarely longer. In cases of recovery the membrane may form again and again, and the patient may be a long time in regaining his usual condition. In other cases the recovery is early and complete.

The mode of death is by asthenia or apnœa, or by a combination of both, but seldom from the brain by coma.

Prognosis.—The prognosis should be guarded. Mild cases may become severe, and, after apparent improvement, severe symptoms may return and the case become fatal.

The characteristic sequel, occurring, however, only in a small proportion of cases, is paralysis, affecting more particularly the soft palate and other muscles about the throat, interfering with speech and deglutition, and often affecting also other parts—more frequently the lower extremities. The paralysis is seldom complete of any of the parts affected, but involves both the sensitive and motor functions. The paralysis sometimes commences in the palate and fauces soon after the separation of the false membrane; but much more frequently it comes on after convalescence seems established—a week or a month after the ordinary symptoms have disappeared. The first indication of the approach may be a nasal sound of the voice, and inability to sound some of the vowels. In attempting to swallow, a portion of the food may pass into the posterior nares. On examination the soft palate will be found flabby, and devoid of its ordinary sensibility. This condition may extend not only to other muscles of the throat and to the lower extremities, but to the upper extremities, and, in rare cases, to the muscles of the trunk and the diaphragm; to the larynx, lungs, and heart; to the organs of special sense, and, in fact, to any part of the body, but observing no particular order, and perhaps never involving all parts at the same time. Sometimes in place of the paralysis, or mingling with it, will be hyperæsthesia and neuralgic pains.

This paralysis, however alarming to the patient, is very seldom fatal, and usually disappears in the course of a few weeks. The affected muscles retain their electric contractility, their bulk, and their proper texture. They are, therefore, in a condition to resume their functions when the deficiency of innervation is removed.

Although the prognosis in this paralysis is generally so favorable, when the nerves from the medulla oblongata and the fourth ventricle are involved, respiration and the heart's action may be fatally interfered with.

Strangulation has been produced by food getting into the air-passages, and, in a few instances, coma and convulsions have supervened and proved fatal; but all these accidents are rare. Occasionally, though rarely, during the paralysis, albumen is found in the urine; but the kidneys are very seldom permanently impaired.

Diagnosis.—Diphtheria is liable to be confounded with scarlatina, croup, tonsilitis, and erysipelas of the throat. It differs from all these affections, and a comparison will show the following distinctions:

Diphtheria.	*Scarlatina.*
In children most.	In children most.
Often vomiting at first.	Often vomiting at first.
External heat moderate.	Great.
Little or no eruption.	Scarlet eruption.
Throat moderately swollen.	More swollen, red, and painful.
Exudate free.	Slight.
Tongue white coat.	Coat loose, tongue red, strawberry appearance.
Hemorrhage sometimes.	Seldom.
Recovery slow.	More rapid.
Sloughing seldom.	More frequent.
Attacks those who have had scarlet fever.	Does not.
Death often by laryngeal obstructions.	Seldom.
Sequel paralysis.	Dropsy.

Diphtheria.	*Croup.*
Epidemic.	Sporadic.
Contagious.	Not.
Chief seat above the glottis.	Below.
Exudate extending to larynx.	Beginning there.
Croupy symptoms later.	Earlier—first.
Asthenic.	More sthenic.
Danger from suffocation and systemic poisoning.	From suffocation chiefly.

Diphtheria.	*Tonsilitis.*
Fever asthenic.	Sthenic.
Swelling at first slight.	More.
Pain slight.	More severe.
Difficulty of swallowing not usually great.	More.
Suppuration seldom.	Frequent.
Membrane marked.	Slight.

Diphtheria.	*Erysipelas of Throat.*
More confined to throat.	More diffused—redder.
Exudate marked.	Not.
No erysipelas of skin.	Skin usually involved.

The prevailing diseases will aid in determining the nature of less distinctly marked cases.

I am aware that many of high authority in the profession make no distinction between diphtheria and croup; but that an inflammation occurs in the larynx and trachea, resulting in the formation of a false membrane, which is not the specific diphtheritic membrane, and is not accompanied by the other diphtheritic conditions, I have no doubt; and I cannot question that a distinction should be made. Yet I must confess that for a number of years past I have not seen such cases as I saw twenty-five, thirty, and more years ago, entirely free from diphtheritic phenomena.

The Pathological changes of structure necessary to diphtheria are limited to the inflamed parts which have been described. In most cases the affected parts are more or less congested, swollen, and infiltrated with inflammatory exudates. Generally these changes are comparatively superficial, but occasionally they are more deeply seated, and then suppuration in different points may occur and abscesses may form. The diphtheritic inflammation, however, does not tend to phlegmonous suppuration, and such results are comparatively rare. The hyperæmia and other changes of the mucous surface are accompanied with a thin mucous exudate at first, soon forming into an opaque layer, which increases by additional exudation upon its under surface and margins, and this material is attached to the mucous surface partly by its tenacity and partly by prolongations dipping into the follicles. At first this false membrane consists chiefly of the proliferated and changed epithelial cells, which are apt, from the shrinking of their protoplasm, to become stellate and cloudy in appearance. This in some cases, particularly in the pharynx, is the permanent condition of the exudate. In other instances, especially in the air-passages, a fibrinous exudation takes place; mingling with it, however, will be found leucocytes and corpuscular bodies, epithelium, blood, and pus; but soon these corpuscular elements disappear, some, probably, by elongating into fibres, others by destructive transformations, and a fibrinous network of more firm consistence constitutes the ordinary false membrane of diphtheritic croup.

In this, as in other forms of the membrane where blood and pus corpuscles are more abundant, bacteria are at least generally present, and also, as already stated, they have often been found in the tissues beneath. When suppuration occurs at the surface of the inflamed mucous membrane, the false membrane becomes more readily detached.

When the air-passages are seriously obstructed the lungs are apt to be collapsed in parts, especially where the exudate extends into the bronchial ramifications, and lobular pneumonia not unfrequently takes place.

The kidneys are sometimes found enlarged and somewhat pale, and, under the microscope, fatty deposits may be found in the renal cells, and hyaline casts are seen in some of the tubules.

In "malignant" cases, hemorrhagic infiltrations are found in various organs and under mucous and serous membranes; and as in other severe forms of fever, the muscular tissue of the heart sometimes presents granular or fatty changes.

The blood is, doubtless, seriously changed in its properties, though its physical changes are not always distinctly marked post mortem.

The specific character of diphtheria, its dependence upon a poison, cannot be doubted; but the positive character of that poison has not been demonstrated, and its mode of action in producing such serious results is unknown. The theory that the bacteria have to do in the causation is certainly plausible, and probably true; but it lacks positive proof. It is, however, declared that these bacterial parasites invade the brain, cord, and nerves, causing rupture of small vessels and slight hemorrhagic effusions, and this and the changes consequent upon it may account for the paralysis and some other symptoms observed.

The particular cause of the paralysis, however, coming on after the other symptoms disappear—whether from the original poison still lingering in the system, or from some new element produced during the progress of the disease, or from some change effected in the tissues by the process of the fever, or from the action of the parasites—is not positively known. The lesion, however produced, or whatever its exact nature may be, seems located in the nerve-centres and nerves which control muscular motion and sensibility, rather than in those affecting nutrition or intellection.

Diphtheria, though usually appearing as a distinct and independent disease, attacking persons in previous health, is sometimes associated with other affections. It may occur during the course of measles, small-pox, typhus, typhoid, and puerperal fevers. It has analogies to scarlatina, and it seems probable that the materies morbi of the above infectious diseases favors the development and activity of the diphtheritic poison. At any rate, the presence of these affections does not prevent the action of the cause of diphtheria, and we have in this an illustration of the fact that two specific poisons may operate upon the system at the same time.

TREATMENT.

The preventive treatment here, as in all other infectious, contagious, or zymotic diseases, requires particular attention; and the same principles apply, and the same general measures are required as in the other diseases of this class which have been discussed. Cleanliness, ventilation, and the observance of all hygienic regulations as to the prevention of outbreaks; and isolation, disinfection, cleanliness, and ventilation to prevent its spread are imperatively demanded.

The curative treatment is general or local; antidotal or symptomatic; of the primary disease, or of the sequelæ.

There is no general specific antidote—no known medicine which, when administered, is certain to neutralize the poison and arrest the disease—and yet there are some grounds for the belief that certain articles diminish the activity of the poison and abate its effects, if they do not entirely destroy it, or fully prevent its action.

The remedies most used with a view to antidotal effects are *local applications* to the seat of the specific inflammation and exudate.

On the supposition that the bacteria are concerned in the causation of the disease, and that they abound most in the exudate and the immediate parts producing it, spreading from these points as from a focus, penetrating the tissues, passing into the blood, and poisoning the whole system; or that some poisonous material is produced locally which by absorption causes general septic effects, the object of local treatment is to destroy these parasites, or the septic material, whatever it may be, which is present; to abate the inflammation, and to prevent absorption and the poisoning of the blood and tissues.

This theory of the nature of the disease and its causation seems to me to be based upon evidence sufficient not only to justify, but to demand efforts for accomplishing these objects, and in my judgment such local, antidotal treatment is of much importance.

The local inflammation is peculiar and specific, and needs to be not merely abated, but, if possible, arrested by removing its cause; and as it is quite different, it should be distinguished from the process of repair which follows this and other lesions. Though there is an indication for arresting the specific inflammatory action, yet it should be borne in mind that the false membrane is most easily separated from the mucous surface by the process of suppuration, and that the pus discharged tends to prevent septic absorption. It may, therefore, be an object to promote this process while the local disease continues.

Various local remedies have been recommended for accomplishing the different objects deemed desirable.

Bretonneau, to whom the profession is indebted for the first systematic account of modern diphtheria, recommended caustics—particularly the strong mineral acids mingled with honey—for the purpose of destroying the false membrane and changing the action of the surface beneath; and the caustic treatment, more frequently substituting nit. of silver for the nitric acid advised by Bretonneau, has been extensively followed. At the present time, however, it is in much less favor than formerly, and is to a large extent abandoned. The fungi are too deep and too much diffused to be effectually reached by these applications, and they have often been found to increase the local suffering without compensating benefits. The dissolving of the false membrane chemically might of itself be desirable, but this cannot be done without producing an irritating effect upon the living tissues.

Astringents are less objectionable, and may be used; but their efficacy is not great, and they are not to be depended upon as important remedies.

In high inflammatory conditions, with much local heat and swelling, *ice* may be applied externally to the neck, and bits may be repeatedly taken into the mouth, and allowed to dissolve in the throat with decided advantage—abating the inflammation, and particularly relieving the pain of swallowing. This is palliative, diminishing the effects, rather than antidotal, operating upon the cause ; and yet the cold may diminish the activity of the morbid germs. It is often the case that palliative, and more radically curative results are produced by the same agents ; and when such actions are combined, the remedy is doubly indicated. In the more persistent and less actively inflammatory glandular swellings, oily embrocations, or in still more subacute or chronic cases, iodine liniment may be useful.

Covering the membranous patches with a pellicle of the ethereal tinct. of tolu, so as to exclude oxygen, has been recommended, and has been thought to prevent spreading. This may be useful, and would probably be innocent if it did not interfere with other and more efficient means.

Steaming the throat early in the attack promotes secretion, which tends to wash away the parasites, and certainly to soothe the irritation and abate inflammation : and later in the disease, when the membrane is adherent, it tends to promote suppuration, and thus promotes its removal and the prevention of septic absorption. Whatever else is done, steaming, frequent and repeated, from the relief of present suffering which it so generally affords, and from the hope of more radical benefit which it offers, should be thoroughly practiced.

Simple water may be used, or it may be variously medicated to meet different indications ; and the methods of its application are various. Heating and atomizing instruments are convenient and efficient, but are not always at hand ; and a vessel of hot water with a funnel, a coffee-pot with its spout, or a pitcher with a funnel of paper over it, may readily be extemporized, and where the patient is old enough to co-operate with the nurse in its use, these simple arrangements will answer the purpose. The steam is best used at a temperature of from 113° to 122° F.

Cohen advises that the room be kept at a temperature of about 75°, and that the air of the apartment be constantly filled with steam by keeping hot water exposed, or by some other means. Some advise a tent, under which the patient may be kept, where the steam may be more thoroughly applied without having the air of the whole room so thoroughly saturated. The continued breathing of the water-laden air tends to prevent the exudate from drying down and forming a firm membrane, and promotes its expulsion. It will not, however, supersede the necessity of the more active steaming.

To further prevent septic changes and poisonous absorption, some of the various antiseptic applications should be made use of. These may be applied upon a swab or brush, by means of gargles, by insufflation, or by atomizers and inhalations. With a patient of sufficient age and intelligence to manage them, gargles are perhaps safest, and, on the whole, best.

Numerous antiseptic applications have been advised and made use of. Chlorine, carbolic acid, permanganate of potash, sulphurous acid, the hyposulphites, salicylic acid, iodine, bromine, and chloral hydrate, are those most to be relied upon. The following are among the best forms of prescriptions for these purposes :

℞	Dilute Chlorine Water	℥iij
	Alcohol	ʒj

M. For a gargle.

℞	Carbolic Acid	grs. ij or more
	Water	℥j

M. For a gargle.

℞	Permanganate of Potash	grs. iij
	Water	℥j

M.

This may be used once or twice an hour, and when the patient is unable to gargle, a quantity of the fluid may be injected into the throat with a syringe. Almost any child, if encouraged, will eject it.

℞	Hyposulphite of Soda or Magnesia	℈j–℈ij
	Water	℥j

M.

Use in same way.

A solution of sulphurous acid, as strong as can be well borne, cautiously used, is one of the most efficient parasiticides and antiseptics.

℞	Salicylic Acid	℈j
	Alcohol	ʒss
	Water	℥viij

M.

Use freely as a gargle.

℞	Salicylic Acid	ʒj
	Alcohol	gtts. x
	Water	℥j
	M.	

Apply with a swab or soft brush.

Or, the throat may be touched with a moist camel's-hair brush dipped in the pure acid; or, a mixture of salicylic acid and glycerine, of the consistence of a paste, may be applied after washing out the throat. Half an ounce of glycerine will dissolve half a drachm of salicylic acid, if heated. Some of the acid will be deposited on cooling, but it will redissolve on heating. It may be used with warm water. Five grains of the salicylic acid to a drachm of glycerine can be given alone or with a little cream, and will act locally on the throat as a germicide, and upon the system generally as an antipyretic.

℞	Tinct. of Iodine	ʒss
	Water	℥iv
	M.	

Cautiously use as a gargle.

Various mixtures, of different ingredients, are advised by different practitioners. As specimens:

℞	Liquor of Permanganate of Potash	℥j
	Chlorate of Potash	ʒjss
	Water	℥viij
	M.	

For a gargle.

As another disinfectant, the flowers of sulphur, applied by insufflation or blowing through a tube or quill into the throat, is strongly recommended by some; and M. Jaccoud reports nineteen consecutive cases successfully treated in this way. The sulphur is also recommended to be given internally.

When the nostrils are the seat of the exudate, there is more danger of absorption than from other parts; and steaming is less effectual, as it cannot so well be applied to the nasal membrane. Here the disinfecting fluids should be used with a syringe frequently and thoroughly, every hour or two, and so as to secure as complete a discharge from the nostrils as possible. The following is recommended as an injection for this purpose: ℞ Carbolic Acid, gtts. xxjv; Glycerine,

℥ij ; Water, ℥vj. M. The steaming, notwithstanding these applications, must be kept up as thoroughly as may be, without disturbing too much the patient's rest.

I am aware that various caustic and astringent articles have much authority in their favor, and, used at an early period, before the poisonous germs have penetrated deeply, they may destroy them and arrest the process of the disease. But in order that such a result shall follow, they must be used not only early, but so as to reach every part of the diseased surface, and must act with sufficient power to destroy the organisms against which they are directed. This, in a majority of cases, especially in struggling and resisting children, is impossible; and the caustics have so often failed in their object, while inflicting mischief by their violent effects upon the tissues, that, as a rule, the more active ones should be dispensed with. Astringents, as already stated, are less dangerous, but also less efficient; and while they may do some good, and should not therefore be condemned, they are less efficient than those more particularly antiseptic remedies which have been mentioned.

The following mixture, recommended by Dr. J. Lewis Smith, to be applied to the fauces by a camel's-hair brush, is thought to have a decided effect not only in converting the false membrane into an inert mass, but in putting a stop to the movements of the swarming bacteria.

℞ Carbolic Acid, gtts. viij ; Liquid Sulphate of Iron, ʒij or iij ; Glycerine, ℥j. M. Use two or three times a day, between spraying, where that process is thought advisable.

Perhaps no article as an astringent and probable antiseptic has been more extensively used than the muriated tinct. of iron, applied to the part in full strength or diluted; and it is almost an equal favorite for internal use. That it is often useful both as a local and general remedy, general experience will not allow us to deny; but whether it is the *best* remedy for either purpose there are differences of opinion. While its usefulness is acknowledged its superiority is questioned.

For checking the odor produced by the decomposition of the false membrane, the insufflation of a powder composed of one part of salicylic acid and seven of bismuth is said to be efficient.

Lime-water has considerable power in acting chemically upon the false membrane, rendering it more diffluent and more easily detached, and is strongly recommended as a local application in different stages of the disease.

Jaccoud strongly recommends "Nolle's Mixture." It is composed as follows:

℞ Lime-Water.............from 120 to 300 parts.
Solution of Perchloride of Iron...2 to 8 "
Phenic Acid.............from 0.6 to 1 part.
Honey of Roses......................30 parts.
M.

According to its liquidity it may be used as a gargle or with a swab. Diluted with six or eight times its weight of water, he recommends its use internally in spoonful doses once in two to four hours.

As already intimated, the various disinfectants and astringents may be used by inhalation, or may be applied to the throat by an atomizer. The strength of solutions for this purpose must be varied in different cases, but will not differ materially from that of the gargles, prescriptions for which have already been given.

As other specimens of prescriptions for inhalation by atomization—

℞ Salicylic Acid, ʒss; Glycerine, ℥ij; Lime-Water, ℥viij. M.

℞ Carbolic Acid, gtts. xxxij; Glycerine, ℥ij; Lime-Water, ℥vj. M.

℞ Carbolic Acid, gtts. xxxij; Chlorate of Potash, ʒiij; Glycerine, ℥iij; Water, ℥v. M. (Prof. J. L. Smith.)

Dr. C. E. Billington, of New York, who claims to have had a very large and successful experience in this disease, strongly advises the following course of treatment, chiefly directed to the local condition:

℞ Chlorate of Potash, ℈ij; Glycerine, ℥ss; Lime-Water, ℥ijss. M. Tea-spoonful for a child every half hour. Or, ℞ Tinct. Chloride of Iron, ʒj; Glycerine and Water, of each ℥j. Dose the same. This last is not always applicable.

Spray the throat very often by the hand atomizer, with ℞ Carbolic Acid, ♏x; Lime-Water, ℥iv. M. In bad cases wash the affected part often by a syringe, with a weak tepid solution of common salt. He condemns alcohol as overwhelming rather than sustaining, and urges great care and exact compliance with directions in the use of the above means, and to carefully avoid irritation.

The careful, systematic, and unremitting use of these local means, sometimes removing very gently such accumulations as may be possible without irritating the living parts, so as to bring the antiseptics more thoroughly in contact with the tissues, will do much toward mitigating the severity of the disease and diminishing its danger.

The exudate appearing in the larynx and trachea, especially in children, is particularly dangerous from its so frequently producing suffocation. It is difficult, often impossible, to restrict the extension of the membrane downward by any local means, and antiseptic and especially caustic measures cannot be effectually and safely applied to the internal surface of a child's larynx.

When suffocation is threatened, there is an indication for removing the membrane. There are three ways for attempting this, viz., mechanically, chemically, and by tracheotomy. With an angular, blunt brush, aided by the laryngoscope, the membrane may sometimes be caught by it near the glottis, and with a rapid rotary motion portions may be removed. The procedure is a difficult one, and a failure to accomplish much in this manner, in the case of children especially, would be the rule. A trial, however, would be justified where suffocation was imminent, other means having failed, and when the last resort, tracheotomy, is dreaded. The other mechanical method is by inducing vomiting, in which act a loosened membrane is sometimes expelled. This effect will be aided by the nausea which precedes the emesis and induces a free and more liquid secretion from the throat, and by the process of steaming, which will at least moisten the parts, and has, moreover, a tendency to induce suppuration, the most effectual means for separating the false membrane.

The inhalation of the spray of organic acids and of the alkalies has some chemical effect in softening the false membrane. The lactic acid, of the strength of from five to ten per cent., is recommended to be used in spray by the atomizer. *Lime-water* is thought to be still more efficient inhaled in the same way. In the absence of an atomizer, hot water may be poured upon unslacked lime in a pitcher, and the fumes, as they arise, may be directed to the part by a newspaper or a towel in the form of an inverted funnel.

A spray solution of six ounces of lime-water with fifteen minims of carbolic acid, to be used with an atomizer, is recommended for the same purpose.

A solution of carbonate of potash or carb. of soda of the strength of ℈j to ℥j of water may have some solvent effect. None of these means, however, are reliable. These preparations cannot be applied with sufficient freedom and constancy to secure very marked results.

The last resort is to tracheotomy, when suffocation is speedily threatened. The conditions for the success of this operation, it can readily be understood, are most unfavorable. Few would feel justified in resorting to so severe a procedure until so much obstruction to respiration had occurred as to show suffocation to be inevitable without it. By this time the disease has advanced, and the system has already suffered shock. Diphtheria is a general as well as a local disease, and the suffocation is not the only condition threatening life. The exudate may continue to form, and to extend down the bronchi. The operation itself is an additional shock. Experience has proved that, in a large proportion of cases, death follows, though relief to the obstructed breathing is obtained. Yet the operation is sometimes successful. Indeed many lives have been saved by it, and the procedure is not only justified but demanded where the disease is chiefly in the larynx and trachea, and other means have failed to arrest the formation of the membrane, or effect its expulsion, and where the respiration is becoming more and more obstructed without reasonable hope of avoiding suffocation. Though its performance unnecessarily would be an error, the operation may be delayed too long. Some recommend that it should be resorted to whenever there is recession of the chest walls indicating obstruction to inspiration. It seems hardly proper to lay down a positive rule to this effect. All the conditions must be taken into account, and a sound judgment is demanded here, as in so many cases in the practice of the profession. As the operation is a surgical one, its details will not be here described. It is proper however to say that in its performance the surgeon's work has *commenced,* not ended. The tube must be watched and changed, and cleared as may be required. Medicated inhalations may take place through it. Some recommend dispensing with the tube entirely—making an opening in the trachea, and holding the lips apart by hooks, adhesive plasters, and various contrivances. This, experience may show to be an improvement, as the tube in the trachea is certainly a source of irritation. If this can be avoided, while freedom to the breathing is secured, the result must be more favorable.

The local means which have been described, though occupying an important place in the treatment of diphtheria, must not supersede general measures.

Constitutional treatment must not be neglected. It is perhaps too much the fashion of the present day to underrate the value of all treatment in specific diseases that run a course, and for which we know of no positive and certain antidotes. Though such diseases may not be completely arrested, they may nevertheless, to some extent, be antidoted, their severity diminished, and their course abbreviated. Such certainly is the case in many instances, at least, in cholera—perhaps the most formidable of the specific diseases—and such I believe is the case in diphtheria.

From the large number of remedies which have been recommended and rejected in turn, the inference might be drawn that none of them can be of much value—and it is quite certain that no remedy has been discovered nor method devised, which is always, or in a very large proportion of severe cases, successful. It is therefore proper to speak with becoming caution and reservation of the efficacy of any measures : and yet my own observation and experience have given me much confidence in the utility of the course of general treatment that I shall advise.

The first indication here, as in all diseases depending upon specific poisons, is to antidote the poison. As already intimated, we know of no remedy which is certain to produce this effect. There are various articles which when brought in contact with bacteria in sufficient concentration destroy their vitality; but it may be impossible to so saturate the system with these articles as to bring them in contact with the organisms in sufficient strength to destroy them, without injury to the patient; and yet, on the other hand, it is quite possible that such articles may destroy some and diminish the activity or the production of others, so as to produce an antidotal effect, though it be imperfect.

The leading articles supposed to have such effects, and to be capable of such use are, quinine, salicylic acid, sulpho-carbolate of soda, and alcohol. The positive or the comparative value of these remedies it is exceedingly difficult to determine. From the different degrees of severity of the disease, as it occurs at different times and in different localities, and from the great differences in individual cases in the same epidemic, reported successes or failures are unreliable guides. Many epidemics and cases are malignant, and not amenable to treatment by any known means; others are mild and will recover without treatment, or even under treatment that is bad. Yet here, as in other cases, however much we may be guided by general principles, experience is the test to which all practice must be brought. However discouraging this view may be to searchers for the truth, and however little consoling and helpful to those who have the responsibility of the lives of diphtheritic patients thrown upon them, it is the only one that expresses the actual state of the case.

Each practitioner, after reviewing the literature of the disease, after considering what is known of its causes, its phenomena, and its nature, and especially after he has had personal observation and experience, must determine for himself the particular course to be pursued. Experience is the chief guide, and yet reports of local and limited experience are unreliable. It now remains to state briefly the course of general treatment in which, in my judgment, most confidence is to be placed.

As diphtheria is unquestionably a disease attended with marked depression and weakness, all unnecessary debilitating measures should be carefully avoided. The patient should be placed under the most favorable hygienic conditions of pure air, proper temperature, and cleanliness, and as much nourishing food as can be digested and appropriated should be administered regularly, and not at too long intervals. Though at the very onset, if the health and appetite have been previously good, little food may be required for the first day or so, its administration should soon be insisted upon, and continued throughout the disease. Milk, farinaceous preparations, and beef-tea must be the staples; but rare, tender, and disintegrated meat may be added in moderate quantity when the stomach can bear it.

While antidotal treatment aims at the destruction or elimination of the poison, symptomatic treatment has for its object the allaying of constitutional disturbance, the remedying of different complications and special symptoms, and keeping up the strength so as to enable the patient to resist the disease. It is quite possible, that, to a greater or less extent, the same means may tend to the accomplishment of both these leading objects. When a patient is seen early in the attack, as a rule, an anodyne, diaphoretic and mild mercurial combined, should be given; for an adult, a Dover's powder (twelve to eighteen grains), and blue mass (four to eight grains). The throat should be thoroughly steamed—hops and vinegar are perhaps the best. (See the method described for tonsilitis.) The anodyne and alterative should be followed in a few hours by a laxative (a saline or castor-oil) in a sufficient dose to clear the alimentary canal of all accumulations, but not sufficient to exhaust the strength. Then the patient should be put upon quinine and chlorate of potash—from three to five grains of quinine, and from ten to fifteen grains of the chlorate, for an adult, and proportionate doses for a child, repeated once in from three to four hours, and steadily persevered with while the disease continues, or at least for several days. It might be suspended and alternated with other treatment, if thought best. Should the chlorate of potash evidently irritate the stomach, the quantity should be diminished; or it might be given in some bland fluid largely diluted. Often it will be best, when the stomach is at all irritable, to give the quinine by itself, or with the addition of a small quantity of morphine, giving the chlorate largely diluted as a drink. If there be much pain or restlessness, an anodyne—morphine, or some form of opium, is most reliable—may be given from time to time as required. The bowels should be kept open by the mildest means, generally by enemas; and the local means, already described, faithfully persevered with.

If there be much irritation of the stomach the chlorate may be omitted, and the irritation should be allayed by effervescing draughts, sinapisms over the epigastrium—not retained too long—and possibly morphine in more decided doses. If there is diarrhœa, it should be restrained by opiates and astringents, and whatever distressing symptoms may arise should be relieved by appropriate means. In my judgment the quinine tends to diminish inflammation, exudation, and fever; to equalize the circulation and allay suffering; and, in short, while it abates morbid processes, it sustains vital activities; and there seems to me reason to believe, that, at the same time, it exerts an antidotal effect upon the essential cause of the disease. That it antidotes most effectually the cause of malarial fever is well known; that it operates similarly, though to a less extent, on the cause of diphtheria, I believe. At any rate, the treatment with the quinine and chlorate of potash (the latter article improving the quality of the blood and acting as a gentle eliminative, and, perhaps, antiseptic), is, according to my observation and judgment, the best with which I am acquainted.

The treatment with free doses of salicylic acid has been strongly recommended by some, and I am prepared to believe it may be useful —operating perhaps antidotally, and modifying febrile and inflammatory symptoms—but I have not seen it tested in practice in this disease.

The tinct. chloride of iron has long been a favorite remedy with many, often given in connection with quinine. I think it has some virtues; and in protracted and anæmic cases especially, it may be added to the quinine with decided advantage.

The treatment by free and continuous doses of alcohol has very strong advocates, and nearly as strong opponents. Dr. E. W. Chapman, of Brooklyn, N. Y., is the principal champion of the alcoholic treatment. He does not employ it as a sustaining remedy, for it is to be presumed that his large experience with it has convinced him that this effect of the article has been greatly overrated, but as an antidote or an antagonizer of the special morbid condition of the blood; but he gives it with quinine, and it may not be easy to say how much of his success, which is claimed to be great, is due to the quinine, and how much to the alcohol. He gives these articles from an early stage of the disease, and the alcohol in as large doses as can be borne without intoxication.

I am not prepared to deny to it antidotal virtues, nor to say that it has no soothing or sustaining powers in the suffering and depressed conditions of diphtheria; but I have much less confidence in its good effects than in those of quinine and chlorate of potash. In great depression and sinking it may be resorted to under the same indications and regulations as in other diseases of depression and exhaustion.

The sulpho-carbolate of soda has more recently come into use, and is spoken of favorably by some. I have not had sufficient opportunity of witnessing its effects to express an independent opinion respecting it. It is given in doses of from two to six grains, every two hours, to a child from one to three years old.

The benzoate of soda is said to have been extensively used, and with success, especially in Russia.

The bromide of ammonium, in doses of from two to fifteen grains every three hours, is advised by Dr. Bartholow, from a belief that this salt passes off chiefly by the mucous membrane of the mouth and throat, and modifies, in doing so, the local disease. For the prevention of the systemic affection the same author advises the *liquor iodinii compositus*, one to five drops every four hours; or the same, with the addition of half a part of carbolic acid, the dose of this compound being from one fourth of a drop to two drops, in water, every four hours.

Recently jaborandi, or its active principle, pilocarpin, has been recommended in diphtheria. I have had no opportunity to witness its effects in this disease, but should think it contraindicated in feeble patients or in advanced stages of the affection. At its early stage and in vigorous subjects I think that the free secretion from the throat and the skin which it produces, might mitigate the severity of the disease. I venture to say that in such cases it is worthy of further trial.

There are descriptions of many other special methods of treatment to be found in the medical journals of the day, each supported by reports of success. They nearly all denounce depleting measures, and many of them also condemn alcoholic medication. Many such accounts are worthy of attention, but too hasty conclusions should not be drawn from them. We should not abandon the hope that the nature of this, as well as of specific diseases depending on organic poisons, parasitic or otherwise, may hereafter be better understood, and more effectual antidotes discovered.

For the paralysis sometimes following diphtheria, tonics are generally advised. Elimination, in my judgment, is quite as frequently indicated; and, as a rule, a course of iodide of potassium, or the acetate of potash, or a combination of the two, may precede or accompany the tonics. Where the cure is long delayed, quinine and strychnine, with perhaps electricity, may be required.

INFLUENZA.—EPIDEMIC CATARRHAL FEVER.

This is a typical epidemic disorder of the general system, marked by chilliness, fever, general pains, frontal headache, and much depression of feeling and strength; the chief local manifestation being a catarrhal congestion, inflammation, and morbid secretion of the mucous membrane of the upper air-passages; but the disease is often accompanied with bronchitis, and sometimes with pneumonia, pleuritis, gastro-intestinal, and other inflammations.

That the disease is constitutional or general, rather than local, and should be placed among the general affections, is shown by the fact that there is no constant fixed primary local change, and the general symptoms are out of proportion to the local lesions that may occur. Three varieties have been described, viz., Thoracic, Cerebral, and Abdominal, according as the local disturbance is greatest in one or the other of these cavities—but the thoracic is by far the most frequent. No distinct history of this affection can be traced beyond the fifteenth century; but since then many extensive epidemics of it have occurred, appearing at different times in almost every part of the world.

Its causes are obscure. It has long been believed to depend upon some atmospheric and telluric influences whose nature is still undetermined. The view so strongly expressed years ago by Graves, that it depends upon conditions affecting the surface of the earth, independent of human productions, is declared by Jaccoud to hold to-day. But it has recently been declared one of the most contagious diseases, and to have been frequently conveyed from place to place, and from person to person, by intercommunication. Bristowe affirms that "its conveyance has frequently been traced from locality to locality by the direct agency of those who are suffering from it, and its diffusion in fresh localities from these infected emigrants as centres. It is certain, therefore, that it is infectious in a high degree, and that it may be imported by a contagium, which, like other contagia, is specific, multiplies indefinitely in the body into which it has gained access, and is thence evolved in marvelous abundance." He therefore rejects the theories of telluric and atmospheric influences, and assumes that its strictly contagious character is the true explanation of its epidemic diffusion, and that the virus is given off with the breath. All agree that it has never been imparted by inoculation; that one attack does not prevent subsequent ones; that its seizures are not determined by age or sex; that season has little or no influence upon it; that though it has sometimes seemed to be carried by winds, yet that it has marched against the wind; that temperature has no influence; that barometric and hygrometric states have little effect; and that the influence of hygienic conditions is not appreciable.

While on the one hand it is declared to be carried by persons, as seen by the quotation above, on the other, Jaccoud states that its spread is not influenced by frequency of relations of persons, or by channels of communication—that thinly settled localities, out of the course of travel, become affected, while large cities in the route of communications escape. Jaccoud also states that "in our hemisphere influenza travels from east to west in winter, and from west to east in spring. It has no ascertained period of incubation, as persons coming into the localities where it prevails often take it at once." He regards these facts as proving the absence of contagion, and agrees with the statement of Grisolle, that "nothing proves its contagiousness."

By a purely contagious disease is properly understood one in which a poison is generated in the bodies of the sick and communicated from the sick to the well, producing the same affection, and that the poison is produced in no other way.

Considering the wonderful rapidity of its spread, large regions being attacked almost simultaneously, and whole countries being pervaded in a short time by its presence, it would seem incredible that so much poison could be produced in so short a time in the bodies of the sick; and comparing its spread with that of a typical contagious disease, as small-pox, a belief in its exclusive contagiousness seems to be excluded. That the poison may be multiplied in the body cannot be positively denied, but that this is its only source certainly cannot be proved. When a disease is spreading from place to place with such rapidity, there are likely to be many instances of persons affected with it traveling from the infected locality to one soon to be invaded—but such coincidences or incidents do not prove that the disease is conveyed by such personal communication. One event following another does not necessarily prove a connection between them of cause and effect. Many facts, a large degree of constancy of relations, and the exclusion of other possibilities are required to establish causation in a case of this kind; and it may well be doubted whether the facts will justify the conclusion that influenza is contagious. If it is contagious in any sense, it seems to me more consistent with the facts to place it under the head of "Miasmatic Contagious" affections—a term applied by Liebermeister and others to diseases the poisons of which may be produced and multiplied outside of the body as well as within it.

The simple fact is, we do not know the origin, the mode of multiplication, or the nature of the influence which produces influenza. We are as far from positive knowledge on these points as the Italians were when they supposed the disease to be produced by the influence of the stars, and consequently gave it its present name.

However interesting these speculations, we are more concerned with the facts. The disease appears from time to time in localities and wide-spread regions, independent of conditions that can be understood and controlled. It varies in its severity and particular character in different epidemics and in different individual cases in the same epidemic. It often attacks a very large proportion of the people of the place where it prevails.

It seldom continues in the same locality more than five or six weeks, and its duration is sometimes much shorter. A similar disease, spreading in a similar manner, affects the lower animals—especially the horse—and this may or may not coincide with the human form of the malady. In the horse it is apt to be more severe—at least to prove fatal in a greater proportion of cases—than in men.

An epidemic of influenza is sometimes followed by one of pneumonia, and it is thought to have some connection with still other epidemics; but as no constant or uniform relations have been observed, those that have occasionally occurred have probably been accidental.

This epizootic in horses is strikingly similar to influenza in the human subject, both in its symptoms and mode of spreading, and it seems hardly possible that a disease, spreading so widely and with such rapidity as the epizootic, could be propagated by intercommunication of horses.

The phenomena and course of influenza require further description. The disease commences, as already stated, by general febrile symptoms, chills, pains, etc., and local symptoms soon supervene resembling a severe coryza, or what is called a "bad cold." There is often sneezing; the nose, possibly dry for a short time, soon discharges, at first, a watery, scalding fluid, which afterward becomes more mucous or muco-purulent; the lining of the frontal sinus is involved, accompanied frequently with severe frontal headache; the eyes are often injected and watery; the throat is congested and irritated; the membrane of the larynx is injected and swollen, and the voice hoarse; a cough is developed, and is often frequent; the bronchial tubes are generally more or less congested and their secretion modified, producing sometimes a dry and sometimes a moist cough; and though the bronchial affection may be slight, and the inflammation of the upper air-passages not severe, yet the sense of depression may be great, and the weakness and general suffering is greater than would be produced by a simple coryza of apparently equal local severity. The disease reaches its height in ordinary and comparatively mild cases in a few days, and convalescence gradually takes place, the decline of the disease sometimes being accompanied with a diarrhœa, and often with a sweat. In adult persons removed from the extremes of life, in previous good health, it is very seldom dangerous to life; and, in such cases, never proves fatal unless there be more than the ordinary complications. In young children and old persons, and those debilitated by other diseases or suffering from affections of the lungs, it not unfrequently terminates unfavorably; but in such cases there is almost always more or less inflammation of the capillary bronchi, the lungs, or some other part.

Capillary bronchitis, in young children and in the aged, is not unfrequent, and is an exceedingly serious complication. Pneumonia also, whether lobular—which is most common—or lobar, is apt to be serious; and pleurisy, though more rare, is attended with danger when it occurs. The same may be said of other inflammations, when of much severity. These complications are to be distinguished by symptoms and signs, which will be described when we come to diseases of these parts. The symptoms common to all fevers, such as coating of the tongue, loss of appetite, increased temperature, febrile urine, etc., need not be more particularly described.

In the **Morbid Anatomy** of influenza there is little or nothing that is distinctive. The inconstant complications present appearances such as would be present in primary affections of the same character, or such as accompany similar complications in other diseases.

Hyperæmia of the mucous membrane of the upper air passages, and generally of the bronchial tubes also, is, however, present. Exudations—mucous, and sometimes bloody—into the bronchial tubes are common, and often the membrane is softened. Sometimes a pulmonary congestion is present, but this should not be confounded with pneumonia. The lung is of a dark red or violet color, is more dense than normal, but still crepitates on pressure, and floats in water. The parenchyma is somewhat more friable than normal, and there is often serous infiltration into it, as in complicated cases of typhoid fever and measles. According to Jaccoud, it resembles the condition produced by paralysis of the vagus nerve.

Evidences of gastro-intestinal catarrh, hyperæmia, softening, etc., are sometimes found. These are all local manifestations of a general affection, and the variety in the lesions does not account for the various forms of the general disease found in different epidemics.

In a majority of cases, when death occurs, it is caused by true pneumonia or capillary bronchitis. In the latter, false membrane may be found adhering to the surface of the tubes, or the bronchi may be filled with fibrinous concretions not adherent to their walls. These latter small cylindrical exudates are viscous, elastic, semi-transparent, though sometimes gray and opaque, like the pseudo-membrane.

The false membranous casts lining the bronchi are often themselves tubes, admitting the passage of air through them; the fibrinous deposits, on the other hand, are not hollow tubes, but solid cylinders; and under the microscope they present the appearance of a mixture of inflammatory fibrine and mucus, some amorphous granules and pyoid globules in a tenacious liquid. As in other cases of capillary bronchitis, portions of lung will be found collapsed, while others will be emphysematous. Not unfrequently the inflammation extends to the lung tissue, and the common conditions of lobular or lobar pneumonia are present. These need not here be particularly described.

As further complications, the lesions of pleuritis and pericarditis are sometimes found. In young subjects and adults fibrinous concretions are not unfrequently found in the cavity of the heart; but in old persons the blood in the heart and vessels is generally fluid and dark.

In some cases the patches of Peyer have been found hyperæmic and tumefied, and other portfons of the gastro-intestinal membrane are sometimes found in a similar state. Inflammation of the membrane of the brain has been found in rare cases.

Influenza is distinguished from common acute catarrh, which in many respects it resembles, by the more severe general symptoms and greater depression with the same amount of local disease; but it is particularly distinguished by its epidemic occurrence.

In the beginning of the attack it resembles measles in some respects; but the eruption and other distinctive characteristics of the latter disease, if it be present, will soon manifest themselves.

Prognosis.—The prognosis is variable in different epidemics. As a rule, it is fatal only in the extremes of life, and the percentage of deaths in those attacked is small; but the numbers affected are usually so great that the aggregate mortality in an epidemic becomes large. In London, Dublin, and elsewhere, the numbers of deaths from some epidemics of influenza have exceeded those from the much more frightful epidemic of cholera, because of the great difference in the numbers attacked. Though so very few healthy adults succumb to it, there are in every community so many young children and old or sickly and feeble persons who are attacked, that the great mortality is accounted for.

In those predisposed to pulmonary phthisis, that disease, particularly in the caseous form, is apt to be developed by a severe attack of influenza.

On the whole, then, it is not only an interesting, but an important and even formidable disease.

Treatment.—Though in mild cases and in vigorous adult persons the disease is so short and so devoid of danger that little treatment is required, yet in infants, in the aged and the feeble, the greatest care in management is demanded. The different epidemics and cases vary so much in character and severity, that the treatment will require to be varied to meet the various indications. Still there is a general resemblance in all the cases, and some general principles of management may be laid down.

As the great danger occurs in those whose vital powers are low, and as the disease is attended with depression, debilitating measures should be avoided. Still, cases can be conceived of where, from pulmonary complications, the congestion of the lungs or the brain might be so great as to demand the abstraction of blood to relieve such states on mechanical principles. Revulsive measures, however, would be safer, and should be thoroughly used when such congestions exist. If the patient be vigorous and plethoric, venesection might be practiced as in other diseases where similar pathological conditions are present. In ordinary cases confinement to the house, a mild diet, simple drinks, and perhaps a solution of chlorate of potash, to which might be added some expectorant, as small doses of ipecac., a gentle laxative if the bowels be not freely open, will be all that will be required. If there is much pain a Dover's powder or a dose of morphine and ipecac., or some similar anodyne, will give relief. If the case be more severe in general symptoms, and especially if bronchitis of a severer grade, or pneumonia, be threatened, in my judgment, after perhaps a laxative if judged necessary, quinine should be given in doses of from four to eight grains, a full anodyne (morphine, Dover's powder, etc.) being added to the first dose, and possibly to subsequent ones; and the quinine should be repeated once in from two or three to four or five hours, until half a drachm, more or less, has been given. The virtue of this remedy in arresting incipient inflammations under these and similar circumstances is, in my opinion, beyond question; and its innocency has been tested too thoroughly to admit of any apprehension of permanent injurious effects from its use in this manner. This remedy is applicable to children, adults, the aged and feeble alike. The opiates must be managed with care, especially in the case of young children and where asphyxia is threatened from obstruction to the air-passages. In the latter case opium is contra-indicated, certainly in free doses, as it diminishes respiratory efforts.

When there are accumulations in the air-passages, especially in children, emetics may be of the greatest service in removing the obstructions. An emetic at the onset of the disease is advised by some, who claim that it diminishes materially the severity of the symptoms.

When any complicating inflammations are developed, they *should* *be treated on the same principles as inflammations of the same organs in other cases, taking into account the depressing influence of the influenza poison.* As we shall have occasion to study these inflammations further on, the details of diagnosis and treatment of these conditions need not here be entered upon ; and the reader is referred to the articles on these subjects. Fomentations to the chest, moist inhalations, expectorants, sorbefacients, etc., will come into use ; but here, as in most other cases of pulmonary inflammation, the influence of quinine cannot safely be ignored or its administration neglected. In depressed conditions stimulants may be required, such as carbonate of ammonia, alcohol, etc., under the same rules as in other cases. Occasionally, marked typhoidal and adynamic conditions occur. Quinine, in tonic doses, after the first stronger impression is made by it, should be continued, and every real supporting measure should be resorted to. (See the articles on Bronchitis, Pneumonia, Pleuritis, Œdema of the Lungs, Coryza, etc.)

HOOPING-COUGH.—PERTUSSIS.

This is an infectious disease, generally continuing for several weeks, and very rarely occurring more than once in the same person. It is characterized by slight fever and symptoms resembling a common acute catarrh at first, and afterward by a peculiar paroxysmal, spasmodic cough, which is likely to linger for weeks, and to return after subsiding, from exposure and taking cold.

This affection is met with both in a sporadic and epidemic form; and is likely to occur in all children exposed to those having the disease. This proves its contagiousness, and the peculiarity of the phenomena illustrates its specific character. It is generally more severe when it occurs in spring or autumn, and is not unfrequently accompanied with complications, rendering it severe and dangerous. It is commonly a disease of childhood, probably because before adult life nearly all susceptible to it have been exposed, and adults are protected by its previous occurrence ; and yet it occasionally attacks grown persons, and may be with them, as with children, protracted and severe. The contagion is more likely to be communicated during the earlier stage of feverishness and catarrh, than later in the disease.

After a latent period of a week, more or less, a moderate febrile condition occurs, with symptoms resembling a coryza, some redness of the eyes, irritation of the mucous membrane of the air-passages, and a bronchial cough. This stage may continue from one to two weeks, and sometimes even longer ; but at length the cough becomes more paroxysmal, each paroxysm becoming more earnest and protracted, and soon the characteristic "Hoop" is developed, which renders the nature of the case unmistakable.

The characteristic cough consists of paroxysms of rapid explosive expirations until the chest becomes completely emptied of its residual air. Proper respiration and pulmonary circulation being suspended, the face turns purple and is injected with venous blood, and suffocation seems impending, when the explosive efforts cease and a forcible inspiration occurs with a loud crowing or hooping sound as the air passes through the restricted glottis; and this sound gives the name to the disease. After the chest is filled the explosive cough may or may not be renewed, and when thus renewed the same phenomena are repeated. Commonly at the final termination of the paroxysm a quantity of stringy mucus is expectorated, and not unfrequently, at the same time vomiting occurs. During the coughing, hemorrhage from the nose and others parts sometimes takes place, ecchymosis of the conjunctiva is not unfrequent, and occasionally streaks of blood will be seen in the phlegm thrown up. In feeble children great prostration, and even fainting, may occur at the close of the paroxysm; but in ordinary uncomplicated cases the patients, after a brief period of rest, resume their amusements or occupations.

These paroxysms are repeated at irregular intervals—there may be two or three a day, or as many every hour. When no complications set in, and the relief from symptoms during the intervals is quite complete, the general condition of the patient is not seriously affected, however frequent and severe the paroxysms of cough, unless, indeed, the paroxysms are so frequent as to seriously interfere with rest, or the vomiting so often repeated as to interfere with the digestion of food. Generally after vomiting the patient craves food, and should be indulged with proper articles that are digestible.

Exposure to cold and wet is apt to increase the frequency and severity of the cough, and may induce inflammatory complications. These are not infrequent, and give to hooping-cough its chief danger and fatality. It may prove fatal, especially in feeble children, by loss of food in frequent vomiting, possibly by repeated hemorrhages, occasionally by convulsions, cerebral congestions, hemorrhage or effusions, or by rupture of lung tissue and interlobular emphysema; but much more frequently by bronchial and pulmonary inflammations and their consequences.

Bronchitis of the larger, and sometimes of the capillary tubes, broncho-pneumonia, and what is called catarrhal or lobular pneumonia, are the most frequent complications. When the bronchial tubes going to a part of a lung are entirely obstructed, the air is apt to be absorbed from the air vesicles, producing collapse. In other cases of partial obstruction of tubes, the air passes in with forced inspiratory efforts more freely than it passes out, and vesicular emphysema results. These conditions may be mingled, some lobules being distended and others collapsed—both conditions interfering with the respiratory function and increasing the dyspnœa. These inflammatory pulmonary complications reveal themselves by difficulty of breathing, lividity of face, increased frequency of pulse, elevation of temperature, sibilant, sonorous, crepitant, and subcrepitant râles, without any necessary dullness on percussion—in short, by all the symptoms and signs which mark those inflammations occurring under other circumstances. When these inflammations are established, the cough often loses its peculiar hooping character, and the paroxysms are replaced by a frequent, bronchial, stuffy cough, though sometimes the characteristic paroxysms continue to recur. These inflammations, if not proving more speedily fatal, are apt to be protracted from the irritation kept up by the specific disease, and the results are not unfrequently unfavorable.

Statistics show that hooping-cough, with its complications, is among the most prolific causes of infant mortality under one year of age, and that more than half that die from it are under two years old, and only a small per cent. (about six) are above the age of five.

The Lesions observed after death are those of its complications, viz.: congestion of the mucous membrane of the larynx, and air-passages generally, with secretions into the bronchi, collapse of lung tissue in patches, lobular pneumonia, and vesicular emphysema; and in children, interlobular emphysema. Congestion of the medulla oblongata and the pneumogastric nerves has been described; but it is doubtful whether this is essential and characteristic, or merely accidental, or the result of post-mortem changes. Nothing is more uncertain in its indications, as to conditions during life, than the slighter changes in the quantity of blood found in the nerve-centres and nerves after death. Enlargement of the bronchial glands has not unfrequently been found; but this, it is thought, is accidental rather than characteristic and necessary. Indeed, morbid anatomy throws but little light on the nature of the disease. It is, however, fairly inferred that the virus which produces hooping-cough affects more or less the system generally, but expends its chief force upon the mucous membrane of the air-passages and upon the nerve-centres and nerves concerned in the respiratory mechanism, the peculiar paroxysmal attacks seeming to indicate a special nervous irritation. Whether these irritations of the nerve-centres are secondary to a morbid impression upon the periphery of the respiratory nerves and the results of reflex action, or whether a primary morbid impression is made upon the nerve-centres themselves, is not known. The fact known is, that both the mucous membrane and the periphery of the nerves terminating in it, and the nerve-centres supplying the nervous force, are irritated. The contagium is probably emitted from the mucous surfaces of the air-passages, and the morbid poison is doubtless there, wherever else it may be.

Treatment.—The preventive treatment consists in avoiding exposure to those laboring under the disease, especially in its earlier stages. As it is so much more likely to prove fatal in children under two years of age, they, particularly, should be kept from exposure. While bad hygienic conditions will contribute to its fatality, they seem to have no perceptible influence upon its occurrence.

When attacked with the disease the patient should be carefully protected from taking cold, but proper exposure to the open air in fair weather may be useful and important, after the first febrile symptoms have subsided. The diet should be regulated; easily digested, but nourishing food allowed; and the clothing should be adapted to the season; but if the weather be cold, damp, or changeable, flannel should be worn next the skin.

A large number of remedies have been recommended for this affection. We know of no means for neutralizing the poison, but there are various agents capable of abating the severity and frequency of the cough, and, as many think, of diminishing the continuance of the disease.

The remedy which has seemed to me to exert a decidedly palliative effect, and which, for the last ten or twelve years I have most frequently used, is the bromide of potassium. It no doubt diminishes the sensibility of the mucous membrane of the air-passages and the reflex actions from its irritation—whether by operating directly upon the nerve-centres or upon the membrane and the periphery of the nerves, or upon both, may not positively be determined. The dose for an adult would be from fifteen to twenty-five grains, and a proportionate quantity to a child, three, four, or more times a day, in order to produce its full effect. In smaller quantities it produces a quieting influence, and when long continued the smaller doses may be given. Bromide of sodium or bromide of ammonium may be substituted. Lately the bromide of potassium has been strongly recommended to be used in a five-per-cent. solution by inhalation; the patient to inhale about ʒv of this solution three times a day. In order to its success, which is said to be great in mitigating the cough and arresting the course of the disease, the inhalation must be thoroughly effected by means of an atomizer; this requires the personal attention of the physician, until, at least, the attendants are well instructed in its use. Whether it is more efficient used in this mode than by the stomach remains to be further tested.

The paroxysms of coughing are commonly preceded by sensations which give warning of their approach, and the prompt inhalation of chloroform or ether, in quantities far short of producing unconsciousness, will generally prevent the fit of coughing for the time. By repeating the inhalations the habit of coughing may be broken in upon, and the tendency to the recurrence of the paroxysms lessened. Cases are reported of complete arrest of the disease in a short time by this means. In severe cases, as a palliative, if not as a curative measure, it seems worthy of trial. It would not interfere with other measures deemed necessary. Frictions to the spine night and morning, with belladonna and soap liniment, are thought to have a soothing effect. ℞ Officinal Belladonna Liniment, ʒiij; Glycerine, ʒv; Soap Liniment, ℥ij. M. Rubbed along the spine of the child for five minutes twice a day. Hydrocyanic acid, belladonna, stramonium, aconite, chloral, hydrochlorate of quinine, morphia and other preparations of opium, nitric acid, carbonate of potash, alum, assafœtida, arsenic, quinine, fumes emitted in purification of coal-gas, and many other articles have been recommended, and may have their places in the management of particular cases. When the inflammatory complications occur, they should receive prompt and careful attention. A simple uncomplicated case of moderate severity, with proper hygienic management, may be left without medication, but the severer cases require efforts for their relief, and the complications need to be promptly met. Here, as in other cases of inflammation of the pulmonary apparatus, as in influenza for example, prompt doses of quinine for a day or two will often have more effect in arresting the complications than any other remedy with which I am acquainted.

If the bronchi are loaded, an emetic of ipecac. may be of great service, and, in short, the remedies required for bronchitis as a primary affection, or as accompanying other diseases, will be useful in these cases, modified in their application by the peculiar conditions present.

MUMPS.—SPECIFIC PAROTITIS.

This is a mild, contagious, febrile affection, the most marked phenomenon of which is a specific, non-suppurative inflammation of the salivary, and especially the parotid glands.

Its contagious character is unquestionable; the contagium is carried through the air, and probably chiefly by the breath; its period of incubation is usually about two weeks; the continuance of the disease varies from one to two weeks, and in severe or complicated cases it may be more protracted; and though it is seldom or never fatal, it is liable to metastases which occasionally induce severe symptoms, and are followed by unpleasant results.

The access varies in different cases. Sometimes the first symptom noticed is a swelling and hardness behind the ramus of the jaw, or in some part of the parotid gland, with some stiffness of the jaws or difficulty in mastication and in opening the mouth. At other times a feeling of general indisposition and moderate febrile symptoms are first noticed, continuing for some hours, or a day or more, when the glandular swelling commences. It involves generally the whole parotid gland, and extends more or less to the submaxillary glands, and, to some extent, to the surrounding cellular tissue. The parts are hot, tender, and generally painful; a fever, if not noticed previous to the swelling, is now present in a greater or less degree, with the usual accompanying phenomena, but seldom in a very severe form. Usually both parotids are affected, but sometimes the local disease is confined to one side; and it is said that in such cases the other side may be subsequently attacked.

The skin over the affected parts is often red, and a peculiar expression is given to the physiognomy by the swelling of the posterior sides of the face. The inflammation sometimes extends to the fauces and tonsils, and down the neck externally beyond the limits of the salivary glands. The swelling usually increases gradually for three or four, and sometimes five or six days; it then remains nearly stationary, presenting hard elastic tumors for two or three days longer, and then gradually subsides. When increasing, and at its height, the pain is sometimes quite severe, and the tenderness is decided.

It sometimes happens that during the progress of the mumps the inflammation of the salivary glands abates, and at the same time one or both testicles in the male, and more rarely the mammæ or labia in the female, begin to swell, becoming inflamed, and in case of the male, the testicles often become extremely painful, and great depression sometimes occurs.

In other cases the testicles are not affected until about the time of the natural subsidence of the parotid inflammation, or even some little time afterward. In still more rare cases a metastasis of the local affection goes to the brain—at least that organ becomes affected, apparently from the action of the virus which causes the parotid inflammation; and this occurs at the time of the subsidence of the inflammation of the glands. The orchitis usually subsides without serious consequences; but sometimes, as in other cases of inflammation of this gland, infiltration and contraction of the exudate take place, and atrophy of the organ follows.

Nearly all persons take the mumps when exposed to the contagion, and, as in most other contagious affections, one attack usually protects against subsequent ones. No influences of sex, constitution, or external conditions have any apparent effect upon the occurrence of the disease.

Of the morbid anatomy of mumps little can be said, as its rare mortality has given very little opportunity for investigation. The inflammation of the glands, though specific and non-suppurative, is not known to differ anatomically from other inflammations presenting similar symptoms. There is, of course, infiltration into the connective tissue of inflammatory exudate, causing the hard elastic swelling, and that exudate usually extends a little beyond the glands.

The *treatment* of mumps should be conducted on the same principles as that of other mild specific fevers and inflammations that will run their course. In ordinary cases nothing more need be done than to keep the patient from exposures; to open the bowels with a saline laxative, and to direct a diet which is light and will not require mastication. When the local inflammation is great, and the pain severe, fomentations or poultices may be applied; some recommend leeches, but they are seldom required; anodynes may be administered; and if the fever be unusually high, diaphoretics and other means for its abatement may be useful.

In case the testicles or mammæ are affected, they should be treated as for other cases of inflammation of these parts—rest in bed, fomentations with a solution of muriate of ammonia in vinegar and water, suspension of the testicles, leeches perhaps in severe cases; and sorbefacients later. There is often much alarm when these glands are inflamed, but generally the patient can be assured that no serious consequences will follow.

When the brain or its membranes become affected, the treatment should be prompt and decided; cold should be applied to the head, leeches may be demanded; revulsive and eliminative cathartics and diuretics should be used; counter-irritation should be vigorously applied, and the latter, it is thought, will be more efficient if placed over the region of the parotids.

DENGUE.—DANDY FEVER.

This is a specific disease marked by high fever, inflammation of the joints, severe pain in the limbs, a peculiar rash, and a tendency, after abatement of the symptoms, to their repeated return, thus protracting the affection for a few weeks, and often leaving the health impaired for a longer period.

Nothing was known in our literature of this disease previous to the year 1789, when an affection called "Bone Fever" occurred as an epidemic in Java. The next year, 1790, Dr. Rush, of Philadelphia, described an outbreak of the disease in that city; and, about the same time, a similar affection was reported to have occurred in Africa, Arabia, Persia, and elsewhere in Asia. In 1818 it occurred in Lima, South America; in 1824 it broke out in a body of troops in Rangoon, Burmah. It spread from this locality as an infection. It was supposed to be introduced into the West India Islands from the East, and has since appeared in different epidemics in various tropical and semi-tropical climates, including many parts of the United States. It is thought to be contagious; but whether the material producing it is generated exclusively in the bodies of the sick, has not been positively ascertained. It is quite probable that, like influenza and some other infectious diseases, it is miasmatic contagious.

In the suddenness of its attacks and the height of the fever, and in its abatements and relapses, it resembles relapsing or famine fever; in the inflammation of the joints, it resembles rheumatic gout; and in the eruption, which generally but not always occurs, it resembles measles and other acute exanthemata. It differs from all, however, in its *ensemble* of phenomena, and also to a greater or less degree in its individual symptoms.

Little is known of the duration of the latent period of the poison, or whether any degree of protection from subsequent attacks is afforded by the occurrence of the disease.

Moderate premonitory symptoms are sometimes experienced, but more frequently the invasion is abrupt. There is a high degree of fever, accompanied at first with a sense of chilliness, or more decided rigors, alternating with flushes of heat, dryness of skin, severe frontal headache with vertigo, pain in the eyeballs, along the spine, and in the limbs, and particularly in the joints; and these latter symptoms are so severe as to have suggested the name of "Breakbone Fever," while the general depression of feeling has suggested the further name of "Breakheart Fever." There is great excitement, rapidity, and hardness of the pulse, and rapid respiration; a furred tongue, heat and pain in the epigastrium, loss of appetite, and often nausea; great muscular prostration, and restlessness and insomnia. These symptoms increase and soon become intense, the pulse often rising in frequency to 120, 130, or 140, and the pain in the joints, with stiffness and tenderness on motion, often becoming excessive, and shifting about as in rheumatism; and the affected joints swell, particularly the smaller ones, as in gout. In the course of a day or two, however, a perspiration breaks out and the symptoms abate; but again, on the third, fourth, or fifth day of the disease, there will be some increase of the pain, and an eruption appears, first on the hands and feet, and then extending over the whole surface. This is a kind of erythema papulatum, not unlike an eruption that sometimes accompanies the active stage of rheumatic fever, or that rarely appears in some cases of malarial fever. This eruption is not invariably present, but it very generally makes its appearance, is attended with itching, but disappears on the second day, and is followed by some desquamation. With the subsidence of the rash, the symptoms all abate; and on the fifth, sixth, or seventh day of the disease the patient becomes convalescent, and is soon comparatively well. In a short time, however, he experiences a relapse, but the attack is not quite so violent as the first, and lasts only two or three days; and this, after similar intervals of convalescence, is repeated a second, and perhaps a third time.

After passing through these various attacks, the patient is left debilitated, with pain, swelling, and stiffness of the joints, and the health is not completely restored before ten or fourteen weeks. The stiffness and tenderness of the joints continuing after the patient is able to be about, and causing a stiff, circumspect, and apparently affected gait, gave it the name of *dengue*, meaning *dandy*, and our translation of "dandy fever" has come to be one of the names by which it is known.

Notwithstanding these severe symptoms the disease does not seriously involve the vital organs, there is very rarely delirium or alarming prostration, a good ultimate recovery is almost certain, though in very exceptional cases, at the period of defervescence, death has been known to occur from syncope.

Occasionally, in addition to the ordinary symptoms described, there is bleeding of the nose, swelling of the parotid glands, and salivation, swelling of the lymphatic glands or testicles, and jaundice and ophthalmia.

These phenomena of dengue clearly indicate the existence of a peculiar poison which has its periods of revolution and action like that of ague, miliaria, and relapsing fever. The particular character of the poison, its place and mode of production, and the manner in which it acts, are points for future investigation. A belief in the organic, living character of the poison, in the light of what is known of germinal matter in the production of disease, cannot well be resisted.

The Morbid Anatomy of dengue is also unknown beyond the inferences from the symptoms presented. An inflammation about the joints, and occasionally in the glands, is the chief structural change observed. From its resemblance in some respects to relapsing fever, a careful microscopic examination of the blood is suggested.

The Treatment of dengue, while the profession is unacquainted with any specific for destroying the effect of the poison and arresting the course of the disease, must be symptomatic, and should be conducted on the same general principles as in other specific fevers which run their course. Fortunately in this disease vital organs so far escape, and the high fever in its paroxysms is of such short duration, that the system is seldom overpowered, and has time to recuperate its forces in the intervals of remission; and finally the poison exhausts its force or is expelled.

Eliminative treatment, emetics and purgatives, have been strongly recommended by those who have had experience in the disease, and their judicious use commends itself to the judgment of those who are not so completely swayed by ideas of "supporting" treatment as to lose sight of the facts that in this and similar diseases there is not only an original poison which may be excreted and ejected, but there are also injurious matters, the result of morbid action, that need to be gotten rid of, and which may be hastened in their elimination by evacuant medicines. The high fever may be abated by the ordinary means: cooling drinks, cold or tepid bath, sponging, diaphoretics, etc.

Severe pain may be relieved by anodynes, morphine, or, as strongly recommended by some, by belladonna; and for the stiffness and swelling of the joints, which remain after the acute stage is passed, the iodide of potassium, acetate of potash, colchicum, etc., may be used; and we should never cease to hope that some means may be found to antagonize the poison which is the cause of the disease.

Should dengue occur in my experience, I should try the effect of quinine or salicylic acid—agents which act as antidotes in other analogous diseases, and which would abate the fever and relieve distressing symptoms. In the practice of medicine, when many of the facts are unknown, experimental observations under the guidance of principles and analogies are not only justifiable but demanded for the advancement of science and the interests of humanity. The use of quinine, however, would not be specially experimental, as Moodem Sheriff, in an account of an epidemic occurring in Madras, in 1872, recommends it in doses of from three to five grains, every three or four hours, for the relief of the symptoms; and he speaks highly of it as a prophylactic also.

MILIARY FEVER.

The terms miliaria and miliary fever have been applied to various pathological states where there was a fever with sweating, and a peculiar eruption of small vesicles upon an inflamed base. Thus authors speak of puerperal miliaria and rheumatic miliaria, indicating that in puerperal fever and rheumatic fever a free sweating occurred with an eruption in vesicles on hyperæmic and slightly elevated points of the size of a millet seed. In the latter stages of typhoid fever, as is well known, minute "sweat blisters," or elevations of the cuticle in small points occur, caused by the perspiration freely secreted from the sudoriparous glands not finding a free exit through the cuticle, but separating it in minute patches from the pale skin. These are called *sudamina*. When, however, there are similar vesicles upon reddened and inflamed points, with minute elevations in the true skin by hyperæmia and deposits, whatever other conditions exist, the eruption is called *miliary;* and when such eruption has occurred in connection with a fever which had no other specific character or name, it has been called miliary fever.

The disease indicated by the term at the head of this article is a more specific affection, and yet one far from being uniform in all its characteristics and results.

As far back as the tenth century there are accounts of epidemics of a disease marked by profuse sweating and an eruption such as described.

After the battle of Bosworth, in August, 1486, a time distinguished by extremely wet weather, an epidemic broke out soon after the victorious army returned to London, of formidable extent and fearful mortality. From its locality and the most prominent of its symptoms, it was called the "English sweating sickness." The disease seems to have disappeared, after this fearful outbreak, for more than one hundred and sixty years; but since then, though often at long intervals, many epidemics have occurred in nearly all the countries of Europe of a disease more or less resembling this "sweating sickness," and it has presented an occasional appearance up to the present time. For the last thirty years it has frequently appeared, particularly in France and Italy, but has not prevailed in Great Britain or this country, and the specific disease now known as miliary fever, or suette miliaire of the French, and Schweiss or Friesel of the Germans, has nearly disappeared from our medical literature as well.

Hirsch, of Germany, has very thoroughly worked up the history and character of this affection, and from Zuelzer's article in Ziemssen's Cyclopædia of Medicine, and Grisolle and Jaccoud's recent works on Practical Medicine, and from personal statements of physicians in Rome who have had experience in a disease bearing this name, the account here given has been gleaned.

Specific miliary fever almost always occurs in an epidemic form. It is not endemic, connected permanently with special localities like ague, but suddenly appears in particular places, remaining usually not more than a few weeks, and then entirely disappearing. It often attacks, in the locality of its prevalence, from ten to even forty or fifty per cent. of the inhabitants; but the cases vary greatly in severity—it sometimes being so mild that the patient is scarcely interrupted in his common avocations, and at other times proving fatal in a day or two, or even a few hours. It respects neither age, sex, nor condition; but is rather more frequent with women than men, and in the vigorous age, between twenty and fifty, than at the extremes of life. It is confined to no season of the year; and yet it is more frequent in spring and summer than in autumn and winter, though not very unfrequent in the latter season. While, as a rule, malarial fevers prevail most in the latter part of summer and autumn, this appears more rarely in autumn than in any other portion of the year. It is not more severe in cases occurring in densely crowded cities than in more sparse rural districts. On the contrary, some assert that it diminishes in severity in proportion to the density of population. It has even been observed that during an epidemic it sometimes spares collections of persons in crowded barracks and prisons, while attacking others more hygienically situated. There is no evidence of its having been carried by individuals beyond its original source, or of its being communicated from man to man—experiments of inoculation with the fluid of the vesicles have failed to produce effects—and hence its contagious character is generally denied. The cause and the disease seem to be strictly regional, and to depend on accidental, and generally on transitory, conditions. It is not even climatic, as it has occurred in England, Italy, France, Germany, etc. It is generally thought to be connected with some condition of the soil, as it has often appeared after disturbing the soil by excavations, cleaning canals, and after inundations, etc., and yet it has appeared where no such disturbances have taken place. Unlike most contagious diseases, its occurrence in an individual creates no immunity from future attacks. Though it is doubtless produced by a peculiar poison, yet, as in so many other cases, the exact nature and mode of production of the poison, and the manner in which it produces its effects, are matters of conjecture. Though some have fancied it contagious, the facts of its occurrence and spread are so different from those of diseases which are inoculable and known to be contagious, that nearly all who have observed the disease agree in believing it non-contagious. Considering the unsatisfactory character of the facts bearing upon the mode of production of the essential cause, we need not be longer detained with them here.

The phenomena, symptomatology, and course of the affection, are now to be noted. Though the disease is so often formidable, in nearly all epidemics there are cases of extreme mildness and benignity. Such cases are not preceded in their characteristic symptoms by any perceptible fever, or other derangements, the patient simply breaking out in a profuse sweat, which lasts a variable time, sometimes abating and returning, and followed in a day or two by a miliary eruption such as has been described; and in five or six days all is over, the morbid cause seeming to be completely eliminated from the system. There is every grade of severity and variation of symptoms, from these mildest and simplest cases up to the most severe and complicated.

In the more ordinary cases of greater but still moderate severity, a prodromal stage of two or three days' duration occurs, consisting of feelings of indisposition, headache, pain in the limbs, want of appetite, weakness, especially of the extremities, and more or less chills, these last soon followed by a very decided fever, ending with the profuse and characteristic sweat. When these premonitory conditions are wanting, the beginning is a profuse sweat, generally coming on in the night or toward evening. The pain in the head is now severe, and mostly frontal; there is general irritation of the skin, pain in the limbs, and often a peculiarly painful tingling sensation at the ends of the fingers. The pricking and tingling of the skin sometimes commences in the forehead and spreads over the whole body, at other times it occurs nearly simultaneously at different parts of the surface. The sweating is so profuse that the clothing, bedding, and even mattress and straw bed beneath, are saturated by it. While this sweating continues a vast amount of heat must be generated in the system, as the temperature in severe cases is often very high, notwithstanding the loss of heat by the sweating and evaporation. The pulse is often rapid, generally above 130, though in some epidemics the excitement is not so great, the headache becomes intense, and in the more severe cases sometimes on the first, and at others on the second day, very distressing feelings of constriction in the chest and epigastrium, with precordial pain, and violent or more ataxic and tumultuous palpitations of the heart and abdominal aorta occur, these conditions often inducing the greatest depression and sometimes syncope and death.

This profuse sweat, according to Jaccoud, has two sources of danger, namely, the weakening of the patient's general forces, and the obstruction of the circulation by the blood's losing its watery element and becoming thickened. In this condition the heart may be overpowered, causing death by syncope or asthenia. According to this author, during the sweating the epigastric and thoracic distress is redoubled, the action of the heart indicates a struggle against an obstacle, and there is painful dyspnœa from the obstruction of circulation through the lungs. In this state delirium and convulsions may ensue, and paralysis of certain groups of muscles. In consequence of the loss of the watery portions of the blood the urine becomes scanty and dense, and the bowels often extremely constipated.

In some epidemics and cases the fever, during the sweating, is not so great, and the pulse is not above 100, and sometimes less. At first the pulse is full, but as the sweating continues or recurs, it becomes small and contracted.

The course of the fever varies. It may be continuous, with only seeming exacerbations; there may be several abatements and exacerbations in a day; and in certain epidemics the fever is distinctly remitting, the sweat ceasing and recurring with the abatement and increase of the fever.

From the third to the seventh, and more rarely the tenth day, a peculiar creeping sensation in the skin announces the eruption. Of this there are two forms. First, the red, marked by minute red spots, moderately elevated small papules; but the redness is effaced by pressure; they are seldom upon the face, appear first on the anterior aspect of the chest and body, next on the back, and finally on the limbs.

After a few hours, small vesicles filled with a transparent or slightly opaque fluid appear in the centre of the papules or red spots. The change from the papular to the vesicular form may be retarded, but if the patient survives it is sure to take place. The red eruption may be the only form, but on portions of the surface another form of eruption sometimes appears. Instead of the red and elevated spots, transparent vesicles make their appearance, the skin beneath the elevated cuticle preserving its natural color. The vesicles in these places are of a similar character to those of ordinary sudamina.

The eruptions are regarded by Jaccoud as the effect of the profuse sweating, and as having little other character or significance. They seem to me to indicate, especially the red or papular variety, something more: an irritation of the skin produced by a poison present in it, and probably being eliminated thereby. The eruption does not come out over the whole body simultaneously, nor progress steadily, but breaks out in paroxysms following the exacerbations of fever and sweat. When the eruption is finished, but generally not before, the fever and sweat diminish, the headache ceases, the epigastric and thoracic distress is less constant and severe, the dyspnœa ceases, the cerebral symptoms yield, and the patient approaches convalescence.

About the third day of the eruption the contents of the vesicles become opaque, the vesicles are soon ruptured or their contents dry down, the redness disappears, and from the fifth to the seventh day of the eruption desquamation of the cuticle occurs, sometimes in furfuraceous scales, but more commonly in larger patches, like the peeling off of the cuticle after scarlatina. New but milder attacks of the sweating, fever, eruption, and desquamation may continue to recur more or less frequently for six or seven weeks, or even longer.

The more severe and more continued symptoms do not last longer, as a rule, than from seven to sixteen days, though the relapses, in a milder form, may continue on indefinitely.

After severe attacks convalescence is long and difficult. The patient continues to have palpitation and vertigo, and sometimes gastro-enteric catarrh, and other symptoms arising from changes in various organs.

The immediate cause of death, its frequency, and the period of the disease in which it occurs, differ in different epidemics. It is most common during the febrile and sweating stage, or within the first week. In complicated cases, where structural changes in internal organs are produced and become the causes of protracted symptoms, and ultimately of death, that event may occur at a much later period. It not unfrequently occurs from the second to the fourth day, and sometimes much earlier, from collapse by cardiac paresis and speedy failure, or by cerebral accidents—delirium, convulsions, and coma—produced either by congestion of the brain or by the failure of a proper supply of oxygenated blood. It should be remembered that venous congestion of this organ arrests a proper supply of arterial blood in the minute vessels, and prevents the nourishment of the brain; and that it causes cerebral symptoms and death as much, at least, by this means, as by direct pressure upon the originating and conducting organs of nervous force. Sometimes death is produced in biliary fever by repeated hemorrhages from mucous surfaces. In the more remitting forms the patient not unfrequently dies, apparently by the direct overpowering influence of the poison, as in some cases of pernicious malarial fever. The most common complications, causing death after two or three weeks, are: pneumonia, either croupous or catarrhal, and gastro-enteritis.

The Diagnosis cannot be difficult when the epidemic characters, the initial symptoms, the peculiar sweat, the eruption, the thoracic distress, and the desquamation are observed. It is more likely to be confounded with the free sweats and sudamina that occur at the abatement, or during the progress of some other diseases, as puerperal fever, typhoid fever, or rheumatism; but the special symptoms of these affections and the absence of the paroxysmal fever and the epigastric and thoracic distress will remove doubt.

The Anatomical Changes in miliary fever have not been very thoroughly studied, but none have been reported which are characteristic or essential, or which will fully account for the violence of the symptoms. The most striking is, perhaps, the rapid occurrence of decomposition, which is said by some to "begin almost during life. A few hours after death the skin is everywhere œdematous, frothy blood flows from the nose and mouth, and the odor of decomposition quickly prevails." This important fact, as well as the phenomena of the disease during life, suggests the presence of bacteria or organic microzymes, whose effects on fermenting and decomposing processes are so well known.

The internal organs show great hyperæmia—the lungs, bronchi, mucous membrane of the stomach and bowels, the liver, brain, and spleen are generally, if not always, hyperæmic, and are often œdematous, and the spleen especially, is always congested, enlarged, softened, and often friable. A vesicular eruption is sometimes found on the mucous membrane of the mouth, stomach, and bowels, as well as upon the skin. But these conditions, with perhaps the exception of the last mentioned, are common to all severe and fatal fevers. The heart is reported as soft, and the pericardium ecchymosed; and Jaccoud suggests that in future investigations thromboses and their attendants should be looked for on the one hand, and on the other, lesions of the muscle of the heart. These conditions are suggested by the profuse sweats condensing the blood, and by the cardiac symptoms which occur in grave cases.

In the foregoing account of this very peculiar and interesting disease, I have followed the descriptions, but with some additional remarks, found in the works already mentioned; but the account would not be complete without referring to a modification of this affection and a change of the circumstances under which it occurs, as given me orally by Dr. Valeri, of Rome, physician in chief to Santo Spirito Hospital. He informed me that for some time past (December, 1879), a disease has occurred in different parts of Italy, rather sporadically than as an epidemic, first appearing in Tuscany, the attack commencing and progressing much like an ordinary typhoid fever until about the end of the third week, when, instead of convalescence, a paroxysm of high fever occurs, accompanied soon by a most profuse sweat, commencing first on the forehead, but in a few minutes pouring forth from every part of the body in most astonishing quantities, the fever being accompanied with the epigastric and thoracic distress already described, but apparently relieved by the sweating; and if the fever and distress occur without the sweat the patient soon dies. Differing from Jaccoud, Dr. Valeri regards the sweating as critical and relieving, and to be promoted rather than checked. The truth probably is, that an injurious material is eliminated by the sweating, and that the process is an important one for the relief of the system—is "an effort of nature" to get rid of an irritating and destructive agent, just as the heat and excitement of fever are regarded by many as an effort of the system to resist or expel an injurious agency. But with this sweat, as is often the case with the heat of fever, the "effort of nature" is too great, and the sweating, as the fever, becomes itself a source of mischief and danger. Although the sweating may eliminate a poison, when it is so excessive it causes weakness, thickens the blood, and, as already stated, may tend to obstruct circulation and lead to fatal results.

In these Roman cases, following a fever of a typhoidal type, as in the more ordinary forms commencing without such preceding fever, the paroxysms of fever and sweating are repeated, the same miliary eruption occurs, never appearing on the face, coming first and being most abundant about the neck and anterior aspect of the chest, and being followed by the same desquamation so characteristic in all the forms of miliary fever. In one case related to me where a *post-mortem* examination was made, the specific lesions of a preceding typhoid fever were present; and in another case, of an American gentleman who recovered, attacks of sweating occurred from time to time for many months afterward (as was stated often to be the case in other instances), but they were unaccompanied by other grave symptoms, and required no treatment. In another case, related to me by an intelligent American physician residing in Rome, that occurred in his own family, a fever came on of a remittent type, with some diarrhœa at first, with occasional moderate sweats and miliary eruptions, continuing about twenty days, when the more violent sweats, epigastric and thoracic distress, severe tingling pains in the extremities, and a more abundant miliary eruption occurred, with the usual constipation, and continued with the characteristic symptoms of miliary fever for about three weeks longer. The exacerbations of fever and the paroxysms of distress were relieved by the sweating, the patient usually falling into a sleep after the sweat broke out—this sleep occurring from the exhaustion of the previous suffering and the sudden relief obtained. The eruption, which repeatedly recurred, consisted of very minute hard points, upon which minute vesicles showed themselves, looking like exceedingly minute pearls, and followed by desquamation. In this case, a very peculiar putrescent odor commenced early, and continued during the disease, and the same odor of the breath and taste in the mouth continued to a greater or less extent for some weeks after.

The diet in this case was chiefly milk, with a moderate quantity of lime-water—the milk in free quantity. A good recovery at length occurred.

The disease in this instance was thought to be produced by the disturbing of the old Roman earth in some excavations made near the open window of the room habitually occupied by the patient.

The late king of Italy, Victor Emmanuel, was reported to have died of miliary fever complicated with pleuro-pneumonia. In neither of these cases was the disease prevailing as an epidemic in the locality at the time of the attack.

Treatment.—The treatment in miliary fever, as is usually the case in a disease so severe in its symptoms and so uncertain in its results, has been very various, different remedies having been favored at one time and condemned at another. In the first "sweating sickness" in England the success of medication was so doubtful that the *expectant* method came to be adopted, and this has been designated as the "English method." Afterward, in the great epidemics on the Continent, the belief was entertained that the sweating and eruptions were critical manifestations, and that they must be promoted by all kinds of diaphoretics, and by the warmest rooms and closest coverings. This method was continued for a long time, but was carried to such an excess, and followed by such results, as to cause a reaction. Bleeding, as might be supposed when the views of the physicians of the last century are remembered, had its time and was vigorously used, especially in cases where there was a feeling of suffocation and thoracic distress; but though the symptoms were temporarily relieved by it, the depression that followed was attended by consequences which led to the abandonment of this practice.

Antispasmodics and various nervines—valerian, camphor, and opium—were often used, with relief doubtless to some of the symptoms, but without much effect upon the results of the disease. To excite diuresis, and perhaps to supply to the blood the fluidity lost by the sweating, Seltzer water and plain water in great quantities have been used, and some have added from forty to fifty drops of the chloride of iron daily, especially where persistent delirium was present. Several active drugs, as corrosive sublimate, free quantities of chlorine water, and other antiseptic agents, have been used in the later epidemics in France during the last thirty years, but without such effects as to establish their efficiency or determine their positive value.

In some of the late epidemics, ipecacuanha, from thirty to forty grains, in three doses, each repeated at short intervals to secure an emetic effect, has been praised as exceedingly useful, and it has the approval of Jaccoud and others; but the extraordinary efficiency claimed for it has not been demonstrated.

The use of cutaneous irritants, sinapisms, ammoniacal liniments, blisters, etc., is very unanimously approved by those who have had experience in this disease. There can be little doubt of their tendency to reduce internal congestions and the precordial and epigastric distress which is so great. Jaccoud, with the same indication in view, advises the extensive application of dry cups to the extremities and other parts of the surface. Hypodermic injections of morphine have received the approval of modern experience, when cautiously used, where the pain and suffering is great. In the case related by the American physician in Rome, a large belladonna plaster over the epigastrium afforded more relief of the epigastric and thoracic distress than any other measures resorted to. The general treatment was symptomatic and palliative rather than perturbing.

Warm baths, sponging with various liquids, appear to do good; and compresses, hot and ice-cold, have been used; but their comparative or positive value has not been determined. Warnings have been given against the use of purgatives in large doses, as being irritating and depressing; but it cannot be objectionable to relieve the constipation, so common a symptom, by mild means, especially by enemas. Alcoholic stimulants, says Zuelzer, seem to be indicated only in the severest cases; and, it may be added, their usefulness is far from being proved.

I have deferred mentioning quinine until the last, to give it more prominence. The periodicity of the attacks of fever and sweating long ago suggested its use, and since more has been understood of its physiological and general therapeutical action, and especially since its effects in this disease have been observed, Zuelzer says most observers are unanimous in recommending its use. Gresser, Cronzal, Parrot, and others advise it in large doses; and Grisolle says in the remittent forms of a pernicious character this article, in a dose of one or two grammes—fifteen to thirty grains—will cut short the disease on the fourth or fifth day. He thinks, however, it is not applicable to all epidemics and cases, and that it has often failed of success in the disease as it has occurred in France during the fifteen years before his writing. Jaccoud also advises its use, especially in the remitting forms, which, as we have seen, are the common forms of the affection. Jaccoud says: In simple, mild forms, a light diet and suitable hygienic regulations alone will be required; that the indications from the gastric symptoms are to be met by an emetic, especially as an item of initial treatment; that the general treatment must be symptomatic, and that the adynamia and collapse furnish constant indications for supporting rather than depressing measures. He advises that the covering should be light, the room properly ventilated; that the excessive temperature of the body should be reduced by cold, and that chloride of iron should be given to check the excessive sweats.

In the Roman cases, quinine is thought by the physicians there, not to be indicated. The Roman physicians, however, have not learned the full power of quinine and its efficiency in large doses, even in the malarial fevers so common among them. Small and long-continued doses are still used in ague; but whether in Rome or our own country, such use of this article is much less efficient, and much more likely to be injurious, than larger doses soon discontinued; and those who have testified to the good effects of quinine in miliary fever, have used it in *free doses,* making a prompt but not long-continued impression.

All agree that great care as to diet and exposure is important during convalescence, as a return of symptoms from imprudence is frequent.

There are no known means of prevention but to leave the place where the epidemic influence prevails. Fortunately it does not long continue epidemic in the same locality at a time. Its more endemic and sporadic occurrence in Rome has been referred to.

From the examination given this subject it seems reasonable to conclude, that miliary fever is a specific disease produced by a peculiar poison, but that the poison does not originate in the body and is not multiplied in it in a manner to be communicated to others, or at least this is not the principal method of its production and spread; that it is a disease of variable severity and course, and of uncertain termination; and that it is therefore difficult to determine the value of treatment. The examination further shows that the weight of evidence, both from analogy and experience, is in favor of an emetic of ipecacuanha in the beginning of the disease; of counter-irritation and cupping to relieve internal congestion; of diluent drinks—of Seltzer or simple water—to supply the loss to the blood produced by the profuse sweating; and the testimony is in favor of administering quinine in decided antipyretic doses, with the hope of abating the congestive and general symptoms, and of possibly exerting an antidotal influence upon the cause of the disease. Other remedies may be required for meeting special indications; the diet should be properly attended to; bathing should be practiced, and as far as possible the strength should be sustained when adynamia and depression are manifest. Here again we should hope for the discovery of specific remedies for directly antagonizing the cause of the disease.

I have been induced to occupy so much space in the description of this disease on account of its scientific interest in relation to other epidemic diseases; and also by the fact that many of the ordinary text-books, English and American, contain no mention of it. Its points of resemblance to, and its contrast with, ague, cholera, yellow fever, diphtheria, influenza, typhoid and relapsing fevers, dengue, and the exanthemata, suggest exceedingly interesting questions of etiology, pathology, and therapeutics which await further elucidation; and the facts in regard to each of these diseases tend to throw light upon all the rest.

Since the foregoing article was written, I have received, in answer to inquiries, a letter from Dr. Pantaleoni, one of the oldest and most reputable physicians in Italy, in which he questions the existence of miliary fever as a distinct disease. He does not deny the phenomena—the sweating and the eruption—but thinks them "symptomatic and epiphenomenal," of no more importance than ordinary sudamina and miliary eruptions in typhoid and puerperal fevers. In some of Dr. Valeri's cases these symptoms seemed to have occurred as an addition to, or a complication of, typhoid fevers—as epiphenomena—but they can hardly be considered of no importance. One very intelligent person whom I saw, who had recovered from the disease under Dr. Valeri's care, and was one among many other cases from which he had derived his conclusions, was very positive in asserting that the most intense suffering preceded the paroxysms of sweating, and she fully believed that if the sweating, with the relief it brought, had not taken place, she could not long have endured the distress. This sweating disease which now occurs in Rome, whether symptomatic of other affections, or as a principal disease of itself, is certainly different from the ancient "English sweating sickness," and from the affection described by the French and German authors. That an idiopathic sweating sickness has existed in the past, and may therefore occur again, seems to me to be supported by too much evidence and too high authority to be denied. Dr. Pantaleoni thinks the disease of the late king was pleuro-pneumonia, and should have been regarded and treated as such, without reference to the sweating which doubtlessly occurred. Between these differences of views (and Dr. Pantaleoni does not stand alone in his opinions), we may not be able positively to decide; but there are unquestionably cases of diseases in Tuscany and Rome, where sweating and a miliary eruption take place very different from anything which has recently been observed, either in this country or England.

CEREBRO-SPINAL FEVER.

EPIDEMIC CEREBRO-SPINAL MENINGITIS.—SPOTTED FEVER.

This is a specific febrile affection, characterized by a violent and rapid development, sometimes by great depression and speedy collapse, by congestion, and if not too rapidly fatal, by inflammation of the membranes of the brain and spinal cord, with the symptoms accompanying such inflammation; and frequently by a mottled condition of the skin produced chiefly by irregular and excessive accumulation of blood in its vessels.

This disease, under the names by which it is now known, had no place in medical literature until comparatively recent times. Though clinical analogies show a similar, and perhaps an identical, disease earlier, it was not until 1837 that its pathology was carefully studied, and it was fully recognized as it is at present understood.

In 1805 a similar affection occurred in Geneva, Switzerland; and long previous to that, in 1794, Dr. Bard described a disease under the title of "Spotted Fever," which occurred in Rhode Island and other parts of New England, and which is now regarded as essentially the same affection as that which broke out in France in 1837. In 1792 Dr. Williams gave an account of it in North Carolina. In 1806 it appeared in Vermont and Massachusetts, and from that on to 1812 and 1813 it occurred in Washington, Norfolk, Annapolis, some parts of Connecticut, the Canadas, Philadelphia and other parts of Pennsylvania, in New Jersey, and again in Vermont and Massachusetts. For a few years after 1813 it was not heard of, but in 1816 it visited New York; in 1823, Middletown, Conn.; in 1828, Trumbull, Ohio; and since then it has appeared at different times in various places in this country up to the present time.

From 1806 to 1822 evidences of its existence in several places on the continent of Europe are found. Its occurrence in a very virulent and fatal form in France, and particularly among troops in garrisons, in 1837, called especial attention to it, and its reappearance in this country about the same time, and its continuance here and in some parts of Great Britain since, has made it familiar to all students of the profession by the frequent accounts given of it, and, unfortunately, to many physicians who have encountered it in practice.

It has generally occurred as a local epidemic, affecting particular localities of limited extent, and manifesting different degrees of severity and modifications of form in different places, and at different times. For several years past it has been much less prevalent, but occasional limited outbreaks have occurred, and sporadic cases have now and then been met with. It has appeared in most of the countries of Europe, presenting similar characteristics in all respects to those observed in France and in this country. In the winter of 1842–3 a virulent local epidemic occurred in my own experience in the southern part of Michigan, and since that time, up to the present, I have encountered occasional cases. The disease seems to belong to places rather than to classes of persons, as age, sex, social condition, and ordinary sanitary circumstances have apparently little influence over the origin or spread of the affection. Still, men have been affected rather more than women, and some of the most violent and fatal occurrences have been in barracks, in prisons, or in institutions where numbers of persons are crowded together. This was particularly the case in France, where frightful ravages on several occasions occurred in garrisons, while other portions of the population were not so severely affected. Other similar cases have occurred in this country. It has appeared more frequently in winter, when confinement indoors is more likely to take place. And these facts seem to indicate that crowding and want of ventilation may have some influence in its production and severity; and yet it has so often occurred in isolated and well-ventilated dwellings in sparsely populated situations, as to render the importance of such influence questionable. It occurs more among children and young persons than among older persons, but infants under six months are said to be exempt.

The epidemic prevalence and its peculiar character point to a specific poison as its cause; but where and how that poison is produced, are matters open to future investigation. The same uncertainty exists as in the case of dengue, miliary fever, and other similar affections; and while some facts, such as its relations to erysipelas, soon to be mentioned, seem to indicate a personal or contagious poison, the manner of its occurrence and spread is quite different from that of the diseases known to be contagious. Jaccoud asserts, with great positiveness, that the poison is not reproduced in the body affected, so that emanations from the patient produce no effect upon others, and that personal contagion does not exist in the disease. He also regards it as doubtful whether materials from the locality of its prevalence are capable of being transported to other points and producing the disease. It extends in "blocks," as he expresses it, from place to place, passing over intermediate places. He excludes all modes of transmissibility except the aerial, and thinks that the atmospheric diffusibility is limited to a short distance, and that it has not the power of extension of most other infectious diseases.

Drs. Burdon-Sanderson, Sidell, and others deny its contagiousness, and the general experience of American physicians has led them to reject the doctrine of its strictly contagious character.

Two views have been taken of the **Nature** of cerebro-spinal meningitis, some regarding it as a local disease to be classed with the phlegmasia—as differing from common inflammation of the membranes of the brain and spinal cord only in the fact of its occurring epidemically; while others, it seems to me with more reason, and at least in more accord with present prevailing pathological views, regard it as an essential fever, with meningitis as its chief local feature; and place it, as I have done, among the specific febrile affections.

The proofs of its specific character and its alliance with the fevers are to be found in a consideration of its causes, its symptoms, and its lesions.

It appears to be independent of the general influences of climates, but bad ventilation and other hygienic faults, which render the organic expenditure superior to assimilation, and destructive metamorphosis greater than elimination, it is thought favor the action, and possibly tend to produce the specific cause. There is, too evidently for doubt, some influence beyond the common causes of ordinary inflammation. Its relations to other maladies, to Erysipelas, Typhus and Typhoid fevers, to an Epizoötic of similar character among hens and dogs, point in the same direction. But what is still more conclusive, it sometimes causes death before the inflammatory lesion has had time for development; and when the lesion occurs, its products resemble those of erysipelas more than those of common inflammation. The exudates may be either aqueous, cellular and plastic, or purulent. So they may be in common inflammation; but the rapidity of their occurrence and the association of the meningitis with erysipelas in the same region not unfrequently, and sometimes in the same person, indicate a specific rather than a common form of inflammatory action. The lesions are not always limited to the membranes of the brain and cord, but the throat, the skin, the liver, the spleen, the mesentery, and kidneys may be involved. Again, the blood, it is alleged, does not present evidence of simple inflammatory dyscrasia. There is often the "dissolved" blood of the older authors, distention of the globules, solution of the hæmatin in the serum, etc., which does not occur in the same manner in simple inflammation.

Clinical forms show an affinity with the infectious diseases. It has a very violent and rapid form, a slower and less violent one, and an abortive form. Its course and progress are different from common inflammations. There is a want of correspondence between the pulse and the temperature; this, however, often occurs in simple cerebral, spinal, and meningeal inflammations; but there are exanthems, albuminuria, and articular symptoms which common meningitis does not present. From these, and perhaps other considerations, cerebro-spinal meningitis must be regarded as a specific fever, allied to the typhus group, marked by epidemic diffusion, by a precocious and rapid inflammation of the nervous centres, and especially their envelopes, and frequently by cutaneous symptoms of a peculiar character. If this view be correct, the meningitis bears a similar relation to the disease that the affection of Peyer's glands does to typhoid fever, or that the eruption does to measles; but with this difference, that the local manifestation is, from its severity and its location at the nerve-centres, a far more important element, producing more violent symptoms and determining to a far greater extent the result, than the cutaneous eruption of measles, or the lesions of the intestines in typhoid fever.

The **Symptomatology** and course of this disease have striking features. Rapidity of march and clinical gravity are its general characteristics; but all cases are not alike, and there are several varieties in these respects.

1. There is a rapid, violent form, most threatening in appearance, and often speedily fatal.
2. The more common form, not so violent and rapid, but still dangerous and often fatal.
3. A latent form—insidious—not presenting the usual symptoms for some days, but at length manifesting violent phenomena, and often resulting in speedy death, when an autopsy shows the results of an inflammation that must have continued for some days before symptoms of a marked character appeared.
4. An abortive form—premonitory and early symptoms appearing, but soon yielding to the resisting powers of the system, or to appropriate treatment.

An idea of the first, or violent form, may best be conveyed by relating cases. A girl, eight years of age, was seized in the evening with a chill, severe pain in the head, neck, and back. In three hours she was seen lying with her head thrown back, pupils moderately dilated and fixed, eyes turned up in the sockets, pulse variable, sometimes rapid and sometimes slow, and so weak as to be scarcely perceptible; head and trunk warm, but not of high temperature, the extremities cold, purplish, and shriveled; she was breathing slowly, with complete insensibility or unconsciousness; and in three or four hours more death took place. An autopsy revealed no perceptible changes, not even hyperæmia of the brain or membranes.

Another case, occurring in my own experience, though many years ago, is fresh in my memory. Mr. J. B. McK——, a farmer, aged forty-three, of correct habits, in good hygienic circumstances, and previous good health, complained of moderate feverish symptoms, some pain in the head, and a sore throat. He was seen the same evening, when the mucous surface of the fauces, tonsils, and soft palate was congested and thickened, but not so as to interfere with any functions. Slightly reddened streaks were observed on the skin extending from near the ear to about the junction of the anterior with the middle third of the clavicle; the temperature was moderately elevated—probably about 102° F. (it was before the days of fever thermometers), and the pulse was about 100. Some mild prescription was made, I do not remember what; but he was not seen again until the next day about 10 o'clock A. M., when, on being hastily summoned, he was found in the most violent clonic convulsions, and during their intervals, which were short, the head was violently thrown back, and most of the muscles were in a state of tonic, spastic contraction. There was absolute unconsciousness, from which he was never aroused, the convulsions being repeated until death occurred three or four hours later. No medicine was given by the mouth, as swallowing was impossible. An enema was given to move the bowels, and, after consultation, a bleeding of about sixteen ounces was practiced, and mustard plasters were applied, but no impression was made upon the convulsions. This was before the days of hypodermic injections, of chloroform or ether inhalations for relieving convulsions, or the use of bromide of potassium for such purposes; but I am persuaded that none of these, had they been known and used, would have altered the result. The man was strong before the attack, and was fully supplied with blood, and the quantity he lost had no marked effect; but I must say that in other cases of less vigor, or where more blood was taken, it appeared to have the effect of hastening the sinking and the fatal result. No post-mortem examination was made.

Numerous other cases are related, and a number have been seen by myself, where death occurred in from twelve to thirty-six hours, and in some indeed from three to ten hours. In some cases, not lasting over twelve hours, post-mortem appearances are not negative. Congestion of the brain, cord, and membranes, markedly increased cerebro-spinal serosity, and some corpuscular exudates have been found in these rapid cases.

2. The common cases, though less rapid and terrific, are still striking in their phenomena and alarming in their results. Premonitory symptoms lasting from one to several days are sometimes, but not generally, observed. When present they consist of malaise, some feverishness, pains in the head and back, and often in the limbs, vertigo, trembling, sometimes vomiting, and general nervous troubles. More commonly, or at least in very many cases, the attack is sudden, and in a few hours at most, severe and characteristic symptoms make their appearance. The patient, in full health, perhaps in sleep, is attacked, and often cries out in distress and alarm, with violent pain in the head, back of the neck, and lower in the spine. It is almost constant in occurrence, but variable in amount and precise locality, but is not usually increased on pressure. It is not unfrequently to some extent remitting, and sometimes intermitting, and often radiates from these centres along the course of the nerves. Cutaneous hyperæsthesia is often an early and persistent symptom; there is usually difficulty of motility, various contractions, particularly of the muscles, causing the head to be thrown back persistently—a marked and characteristic symptom—and trismus, cramps, and muscular tremblings, are not unfrequent. General convulsions, tonic and clonic, are not very rare, but paralysis seldom occurs, as the anterior columns of the cord are not as likely to be seriously involved. There is debility and collapse, but it is not the same as paralysis. The intellect, usually intact at first, is invaded, in turn, more or less. Different forms of delirium occur, sometimes milder, and at others so violent as to require physical restraint. The more violent excitement, whether muscular or mental, is followed, sometimes in a few hours, generally in a few days, by collapse and stupor, or milder hallucinations if the patients are capable of being aroused; and in cases of recovery, forgetfulness of all that occurred during the disease is not unfrequent. Some become maniacal from the cortical substance of the brain being involved; others lose the sense of hearing or sight; and in others more or less permanent and severe results from organic lesions of the nerve-centres follow. In some the greater amount of disease is in the brain and its membranes, while in others the cord and its envelopes are most affected, and the symptoms are correspondingly variable. In this, as in other inflammatory brain affections, vomiting is not unfrequently an early symptom. Each attack of

vomiting comes on suddenly, without any necessary sense of nausea, and independently of the contents of the stomach; but as the disease advances it usually disappears. Abdominal pains of a neuralgic character may occur about the same time; constipation is frequently present, though diarrhœa sometimes occurs at a later period. The cutaneous symptoms, absent in about thirty-five per cent. of the cases, but varying as to this in different epidemics, are not of uniform character. There may be a mere mottling from irregular congestions of the cutaneous vessels, chiefly of the veins and capillaries, and following the distribution of nervous filaments, or more distinct appearances of suggillations, or a rubeoliform eruption may appear, commencing on the hands and rapidly extending over the body, the redness disappearing on pressure, but returning on its removal; or, more rarely, there may be an eruption more resembling scarlatina; or erythema in spots and streaks; or urticaria; or a herpetic eruption may occur, especially about the lips; or there may be distinct petechiæ, the latter being an indication of danger. In an epidemic in Philadelphia, in 1866–7, in ninety-five cases thirty-six had petechiæ, thirteen had petechiæ with a scarlatinaform eruption, and nine had erythematous spots, with appearances of urticaria. Sometimes the form of the eruption is illy determined, and not unfrequently complicated. In a majority of the cases I have seen, there has been either a purplish mottling or rounded erythematous spots. These appearances must have been common in the early occurrence of the disease in this country to have given it the name of "Spotted Fever."

Pains in the joints, resembling those of rheumatism, sometimes occur; and suppurative inflammation of these parts occasionally follows.

The temperature is exceedingly variable; and no general statement as to its particular height or continuance, applicable to all cases, can be made. It is sometimes high during the first twenty-four hours, falling next day; and after that vacillating—sometimes in cases of great severity going below the normal. It is rarely as high as in most other fevers, there being no regular variation between morning and evening, and scarcely any relation between the degree of heat and the severity of the case, except that, when the temperature falls below the normal, it is an evidence of collapse and an indication of danger. The temperature is doubtless influenced by the seat of the lesion, and its vacillating and uncertain condition depends upon the morbid state of the nerve-centres; but these relations have not been sufficiently ascertained to materially aid in the prognosis.

The pulse is rarely above 100, or 110; is often between 80 and 100; and there is no fixed relation between it and the temperature.

The fever in the course of the disease may be continuous and nearly uniform, remitting, or rarely intermitting.

Albuminuria is nearly constant in some epidemics, generally early but transient; though sometimes it continues through the course of the disease, and appears about equally both in grave and mild cases.

The ocular and auditory symptoms are numerous and varied. Pains in the orbits, dilatation, and, more rarely, contractions of the pupils, conjunctivitis and iritis, visual derangements and loss of vision, and derangement and loss of hearing, and sometimes both blindness and deafness are present, and occasionally permanent, from the brain lesions. Other lesions of function, as dysphagia, etc., may result.

Various other pathological states may exist as complications; such as pleuritis, pericarditis, peritonitis, and synovitis; or pneumonia, bronchitis, gastritis, and enteritis, and sometimes parotitis. These complications are, of course, serious, and add to the dangers already so great; but it has been observed that the parotitis is not always as serious as it is apt to be in other low fevers. Perhaps it acts on the principle of a counter-irritation, relieving the cerebral inflammation.

In an epidemic which I witnessed, and have already referred to, after a few weeks' continuance of the occurrence of the disease in the usual form, it was followed by a series of cases, occurring for some months, distinctly complicated with erysipelas. Patients were attacked with general febrile symptoms, and a diffused inflammation of the mucous membrane of the throat. Under active diaphoretic treatment, with counter-irritation, this would often disappear in a few days, leaving the patient convalescent. In other cases the inflammation of the throat would suddenly abate with the simultaneous appearance of well-marked external erysipelas of the face or other parts of the surface; while in still other cases, on the subsidence of the inflammation of the throat cerebro-spinal meningitis occurred; and in others still, a rapid and diffused inflammation of the peritoneum, pleura, gastro-intestinal, or bronchial membrane supervened, and in all these cases of internal attack death was likely to speedily take place; while in the cases where external erysipelas appeared, recovery sooner or later was the very general result. I remember but one case where external erysipelas occurred, in my experience, where the patient did not recover, though sometimes quite deep tissues were involved, and the cases were protracted. At the same time, in the neighborhood, almost every wound was attended by diffused erysipelas; and puerperal women had hysteritis and peritonitis, and many of the latter succumbed to these forms of disease. A general influence provailed, inducing a peculiar specific erysipelatous inflammation; and when it attacked vital organs, from its rapid diffusion and severe character, the results were most disastrous. The case of J. B. McK——, already related, occurred after the erysipelatous features had appeared.

In the ordinary forms of spinal fever the duration of the disease in different epidemics, and in different cases in the same epidemic, is variable. In a majority of unfavorable cases death occurs from the fifth to the eighth day. Complications may result in death either earlier or much later; and when no organs other than the brain and spinal cord are affected, the patient may die after several weeks, from the results of the inflammatory lesions. In some cases I have seen, with some obscure brain symptoms continuing, persistent emaciation, from failure of ultimate assimilation and nutrition, has occurred, and this marasmic condition seemed to be the cause of death.

In the favorable cases recovery may occur in two or three weeks; though complications, or effusions at the nerve-centres which may finally be absorbed, may cause symptoms to continue much longer. Permanent defects of functions, physical or mental, as already stated, sometimes remain.

The latent forms are analogous to the cases of Typhus Ambulatorius. These cases have been observed and described by Swedish physicians, and their leading characters have already been mentioned.

Abortive cases in some epidemics are not uncommon, especially at the period when the outbreak declines. Threatening symptoms like those of the premonitory stage of the severer cases occur, but a full development of all the characteristic phenomena does not take place, and convalescence is established in two or three days. A mild intermitting variety has been observed in Sweden, where paroxysms of considerable severity, but of short duration, have been repeated a few times at intervals of twelve hours, followed soon by convalescence.

Prognosis.—In ordinary cases of the full development of the disease the mortality is great. The most favorable reports show a death-rate, when on any considerable scale, of thirty-three per cent., and usually it is from forty-five to seventy-five per cent., and in exceptional cases, especially at the earlier period of an outbreak, nearly or quite all die. Several such instances in France and elsewhere have been reported. The poison or epidemic influence, whatever it is, seems to have different degrees of concentration and virulence at different times and places.

The Pathological Anatomy of this disease, when it continues a sufficient length of time for its full development, is quite characteristic.

The skin after death shows evidences of the suggillations and ecchymoses so often seen in the course of the disease; the *rigor mortis* is generally well marked; in the protracted cases there is often much emaciation, and the muscles are found to have undergone more or less granular degenerations. The most characteristic anatomical changes, however, are in the cerebro-spinal axis. The dura mater and arachnoid, though usually more or less affected, are not as uniformly or as decidedly changed as the pia mater. This membrane is quite uniformly found congested, often greatly punctated with capillary hemorrhages, and rendered opaque and thickened by interstitial exudations. Leucocytes and purulent or pyoid cells are exuded into the membranes or upon their surfaces, often presenting a greenish or greenish-yellow appearance; and a more consistent or gelatinous material, composed of various cellular and coagulable elements, is often found in free quantities in the fissure of Sylvius, the infundibulum, the pons, and the cerebellum. Sometimes the whole convexity of the hemispheres is covered, and the sulci between the convolutions are filled by this exudation. While the membranes of the brain are thus affected, and the brain itself is hyperæmic and sometimes infiltrated, quite as characteristic, and often still more marked, changes appear in the membranes of the cord and in its substance. There are found here, hyperæmia, exudations of serum, pus, and gelatinous material, of greater or less thickness, in the spinal cavity, covering the roots of the nerves, and in cases of long standing pressing upon the cord and interrupting function.

In the more protracted cases the heart muscles are soft and friable, having undergone granular degenerations in many of their fibres. The blood is usually dark and fluid, staining the walls of the vessels. The hepatic cells and epithelium of the tubes are often granular by deposit of fat; and in the breathing apparatus, bronchitis, catarrhal pneumonia, and other changes are sometimes found.

The **Diagnosis**, when the disease is epidemic and well marked, is easily made in the majority of cases. It may, however, be confounded with tubercular meningitis and with typhoid fever. The suddenness of the attack, the intense headache and muscular rigidity, and the causeless vomiting; the absence of diarrhœa, of the typical thermal lines, and of the typhoid eruption, etc., will distinguish it from typhoid fever. Tubercular meningitis is sporadic; it comes on gradually, or is preceded by prodromic symptoms; there is seldom the throwing back of the head; there is an absence of the peculiar eruptions; and the general march of the disease is different. In both there is variability of symptoms, but the spinal meninges are not as much affected in tubercular cases, and the rhythm of the pulse and respiration is more disturbed. A careful comparison of the fuller history of the two affections will generally enable the physician to make the distinction.

The **Treatment** of this disease, as its great mortality shows, has for the most part been unsatisfactory.

The first indication, assuming the cause to be a specific poison, is to neutralize or expel that poison. But here, as in so many other cases, our knowledge, both of the poison and its antidotes, is so entirely at fault as to render all attempts at the fulfillment of this indication entirely experimental. Still, exciting a free perspiration at the beginning of an attack, I have so frequently seen followed by such marked and permanent relief as to suggest the possible expulsion of a poison in that process. But the more tangible pathological and symptomatic indications are, to abate the excitability of the cerebro-spinal apparatus; to prevent or diminish the fluxion to, and the anatomical changes in, those centres; and finally, to promote absorption of the inflammatory exudates, and in the course of the disease to meet any complications and distressing symptoms by appropriate measures.

To meet the indication of allaying the excitability of the brain and cord, opium in large doses has been used in this country since 1808. The hypodermic injection of morphine is perhaps the most certain and efficient method of administering this drug. Large doses of Dover's powder, or of morphine, ipecac., and bromide of potassium, would seem well calculated to fulfill the indication, and at the same time to induce the perspiration which seems desirable. Should emesis occur, no harm would be likely to result from it, and the dose might soon be repeated if rejected. Lately various articles have been used, related to opium in effects, but which are thought to be more efficient in controlling the amount of blood in the affected parts, and equally or more efficient in diminishing their excitability. For these purposes not only bromide of potassium in large and repeated doses, from forty to sixty grains or more once in two or three hours, but chloral hydrate, ergotine, and belladonna have been used. Cases have been reported of a grave character where these agents have seemed to have decidedly good effects. A grain of ergotine and one tenth of a grain of extract of belladonna every four hours, or chloral hydrate sufficient to bring the system under its full narcotic effect, have been strongly advised.

The Calabar bean, from its alleged effect of diminishing spinal hyperæmia, received for a time much attention and a faithful trial, but it has not fulfilled the hopes that were entertained of its beneficial action.

For diminishing the fluxion to the nerve-centres, prompt and extensive counter-irritation seems called for. The fact that cutaneous erysipelas so markedly relieves and prevents internal inflammations in the cases where it occurs, and the general fact of the frequent abatement of the inflammation in one part when it occurs in another, suggest this remedy; and experience confirms the propriety of its use. The earlier the more efficient; for when decided anatomical changes have taken place the morbid processes cannot be so much influenced. Before they are fully established, the morbid action may be diverted to less vital parts. Extensive applications of mustard, ammonia, or to a less extent cantharides, should be promptly made. I am quite confident that I have seen serious consequences averted by the early application of extensive counter-irritation, together with active diaphoretics, as large Dover's powders, acetate of ammonia, warm drinks, etc. My experience was before the days of jaborandi; but I should now be inclined to try that agent in the early stage of these cases. I have made use of ext. of veratrum viride in the more sthenic cases, and with apparently beneficial results; but depression of the heart's action is often so marked a condition, that it should be used with great caution, or not at all. Jaborandi often depresses the heart's action to some extent, and therefore should be used cautiously, and its effects watched, but it is less depressing than the veratrum, and more diaphoretic, and should be preferred. At least it seems to me worthy of a full trial in the early stages of the disease. Dr. Stille advises the application of ice to the spine and head, and Jaccoud recommends cold lotions when the fever is high. These means are worthy of being considered, though their usefulness has not been established.

The use of quinine in free sedative doses has been resorted to, by different American practitioners particularly, and very strongly recommended. The late Dr. Pitcher, of Detroit, among others, strongly approved of its use; and though I have no sufficient personal observation of its effects, my present views of its action would incline me to its use. Jaccoud and Grisolle doubt its good effects, except in intermitting cases, and the former says: "While some have had good effects from it, others have found it useless." I can well understand that in advanced cases this, as well as other remedies, will have little or no effect; but still believe that in the very early stages this, as well as the other remedies suggested, may have decidedly good effects.

The indication of promoting the absorption of the inflammatory exudates is to be fulfilled by the use of iodide of potassium and other sorbefacients and eliminatives, and perhaps also by blisters · but the efficiency of any of these measures cannot be relied upon.

The bowels should at least be kept open, and, when the strength will allow, the revulsive and eliminative effects of cathartics may be very useful. It is customary, when the strength fails and collapse occurs, to resort to supporting measures; but in the cases of acute depression they have but little effect. In the more protracted cases, with debility and depression, the best assimilable diet and tonic medicines should not be neglected.

In cerebro-spinal meningitis, as in other inflammations, specific and non-specific, the question of blood-letting naturally arises. Those who regard the disease as a simple inflammation, rather than a fever with a specific inflammatory action, and who regard blood-letting as an important agent in reducing inflammation by allaying excitement and diminishing fluxion of blood to the affected part, would be inclined to the use of this agent in this disease; and some whose opinions on medical subjects are entitled to great respect, believe that a venesection, though not always efficient, still affords the best prospect of averting a severe and fatal result when practiced at an early period, and especially when vigor of the circulation and much blood-pressure are present. The influence of the loss of blood upon inflammatory actions in general was long exaggerated, and may still be in some minds, while not sufficiently appreciated in others; but I think it must be admitted by all that it has less power over specific inflammations depending upon a poison which it cannot remove or divert, than upon common inflammations not depending upon such poisons. Few could suppose that the loss of blood would arrest a variolous inflammation, or would recommend it for that purpose; and on the supposition that in this disease there is a peculiar poison, and that the inflammation is specific, analogy would suggest the comparative inefficiency of the remedy in these cases. Besides, in specific inflammations generally, and certainly in spinal fever, there is a marked tendency to depression and collapse, which theory suggests, and experience proves, is likely to be increased by the loss of blood. From the little prospect there is of the bleeding relieving the inflammation, and the greater prospect of its aiding in the production of collapse, its general use would seem clearly to be contra-indicated. If the patient was decidedly plethoric—had more than the normal and proper quantity of blood—there could, perhaps, be no objection to diminishing it; or if, by its diminution, the general condition of the system were improved, or oppressed functions relieved, bleeding might be useful; but the general state in these cases is far from demanding it, and no particular functions are likely to be relieved by it. In the epidemic occurring nearly forty years ago, to which I have referred, I witnessed sufficient trials of the remedy. In some few cases it seemed to produce temporary relief, and in some it was *hoped* that it had an effect in preventing a fuller development of the local affection; but in the large majority of cases no beneficial effects in any particular could be perceived; and in too many cases, as already stated, collapse and death were evidently hastened. The pulse would become small and flickering, and reaction could not be induced. On the whole, then, neither on theoretical principles nor from experience or authority, can bleeding be placed among the ordinary remedies for epidemic cerebro-spinal meningitis.

To summarize the treatment which seems to promise most: If the patient be seen in the premonitory or early stage of the attack, he should speedily be brought under the influence of an anodyne and sedative diaphoretic; and pediluvia and external moist heat, followed by the extensive applications of sinapisms, should be used. The choice of internal agents should be between quinine in doses of six to ten or more grains, together with morphine in doses of one sixth to one third of a grain, the quinine certainly, and the morphine probably repeated once in two, three, or four hours according to effects: or opium, ipecac., and bromide of potassium, in free anodyne and diaphoretic doses; or jaborandi in quantities to induce its full diaphoretic action, or the chloral hydrate in narcotic doses. If the bowels have not been freely open, they should be moved with enemas, as these will not interfere with the other measures. These narcotic and diaphoretic effects should be kept up for twenty-four hours, more or less, when, if the symptoms persist and the disease is fully developed, cathartics, in which a mercurial is combined, may or may not be given, according to the strength of the patient and the condition of the bowels; and the ergot and belladonna, a blister to the neck and between the shoulders may be resorted to, or the blisters may be applied at a greater distance, or omitted, and ice may be applied to the head and spine. The continued use of the bromide of potassium, and later as effusions occur (and they occur at a comparatively early period), the iodide of potassium in as free and persistent doses as can well be borne, will aid, or at least tend to, the accomplishment of the desired results.

Other methods may be tried in epidemics where these means entirely fail; but it must be remembered that toward the close of a local epidemic the cases become milder; and the last remedies used, though apparently more successful, may not be the best. It is easy to be deceived by this state of things, and many methods of treatment have obtained an undeserved but transient reputation, in this and in other epidemics, by the great differences in the severity of the cases to which they have been applied.

Dengue, cerebro-spinal or spotted fever, and miliary fever, from their commonly occurring, but subordinate and inconstant cutaneous phenomena, may properly be regarded as a transition series, and placed between the continued and eruptive fevers, or the *acute exanthemata*, which are next to be considered.

This class of affections, occurring more frequently among children than adults, as the first exposure, which is usually in early life, induces them, is treated of at greater length, with more detail of history and description, in treatises on Diseases of Children; but an account of their essential features, and the important items of their management is expected in a work on the Practice of Medicine. These acute exanthemata present certain phenomena common to all of them alike, and indeed some features common to all the specific fevers; but each has peculiarities in a definite series of events giving it a distinct individuality.

The first feature, allying them not only to each other, but to the fevers we have been considering, is their dependence upon a specific poison as their cause. This fact no one questions, as the proof is amply demonstrable.

The next feature common to their class is, that they are produced, so far as we have any evidence, by poisons generated exclusively in the bodies of those affected with the disease, and these poisons are transmitted from person to person, either by sensible contact, by inoculation, or through the air; and this exclusive method of the production of the poisons and the propagation of the diseases, renders them strictly and typically *contagious*. They are said to be propagated by fomites; but this does not differ essentially from the other modes, as the poison is simply attached to some substance, as clothing, etc., which retains and conveys it, as upon the inoculator's lancet, to act either by contact or through the air.

Another quality which they have in common is, that with a general fever, they have each a peculiar cutaneous inflammation, constituting a leading characteristic of the disease. Again, in all, one attack, as a rule, protects from subsequent attacks of the same affection; and in still another respect they agree, that when commencing, with some variations, but with scarcely exceptions, they persist in their course, and if not cut short by the death of the patient, pass through a somewhat definite series of changes. After the poison is received into the system, there is a period of *incubation*, in which the organic virus is doubtless multiplied, until it becomes sufficient in amount to produce its morbid effects on the fluids, the tissues, and the organs, usually in regular and systematic order.

These features give a distinctive character to these affections, and place them in a well-defined class.

VARIOLA.—SMALL-POX.

This, perhaps the most interesting, and when uncontrolled the most terrific of these affections, is first to be noticed.

Small-pox may be defined a specific contagious fever, characterized by severe pain in the loins during the earlier stage, and by a cutaneous inflammation appearing about the third day in hyperæmic points, speedily followed by deposits, causing a papular eruption, which passes on to a vesicular and ultimately a pustular form, with the formation of a minute slough at the point of its appearance in the skin, usually sufficient to leave a small pit or scar-mark as a permanent evidence of the occurrence of the disease.

This eruption attains its full development about the ninth day of its appearance, or the eleventh day of the disease; after which it dries down and forms a crust, which, when falling off, leaves for some time a vascular and reddened spot, which in time loses its extra vascularity and presents a depressed point paler than the surrounding skin, constituting the permanent marks just mentioned.

The period when this disease first made its appearance, and the manner of its origin are unknown. No distinct account has been found of it previous to the Christian era, and no recorded evidence of its epidemic prevalence is given before the sixth century. This by no means proves its non-existence before that time, but it could not have escaped the notice of Hippocrates and other voluminous early medical writers had it been of general prevalence in their times. It was not found to have existed in America before its discovery by Europeans; but it was soon after introduced by them, and has since that time, by the more free intercommunication of nations, spread over nearly the whole inhabited globe, and has at no time become entirely extinct. Its ravages for a long time were the terror of nations, and its wide-spread prevalences have caused the destruction of innumerable lives. It has, however, in modern times been robbed of much of its terrors, first by the practice of inoculation, and since by Jenner's discovery of vaccination; and should that be thoroughly and universally practiced for a sufficient time, it is probable that the disease might be completely and forever extinguished.

Very few persons of any age or condition are exempt from the influence of the contagion when they are brought unprotected within its range. Fortunately, one attack, however mild, exempts the individual from all future occurrences of the malady, and yet in exceedingly rare instances, some have repetitions of the disease. Though greatly diminished in violence by inoculation—inserting into the skin a particle of the small-pox virus, and thus communicating the disease—though generally prevented or greatly modified by the practice of vaccination, to be described; yet when at the present day it occurs in persons unprotected by either of these processes, it possesses the same virulence, and is attended under like circumstances with as great a mortality, as in the days of its frightful prevalence.

The practice of inoculation, which, previous to vaccination, did so much for humanity, was introduced into England (and soon afterward was adopted elsewhere in Europe and this country) by Lady Mary Wortley Montagu, who had witnessed its beneficial effects in Constantinople, where it had been imported from Persia and China; and in justice to her sex, no less than to her memory, and as an evidence that women may benefit the world by services for the prevention and mitigation of disease, her name is mentioned, and her energy, zeal, and perseverance, in the presence of opposition, are acknowledged.

The practice of small-pox inoculation, which has mostly gone out of use, simply because a better plan has been discovered, reduced the mortality in those receiving the disease in this way to an extreme minimum; and in like proportion prevented those disfigurations, which to many, especially of the fair sex, had terrors scarcely less than the danger to life.

The period of latency of the inoculated form of the disease, is seven or eight days. On the second day after the insertion of the matter, a small papule appears at the seat of the puncture, which, by the fourth day, is changed into an umbilicated vesicle depressed in the centre. On the seventh day the vesicle, or blister-like eruption, which before contained a fluid resembling lymph, is converted into a pustule by the effusion into it of purulent matter. About this time the lymphatic glands above have become swollen and tender; and on this, or the following—eighth—day, rigors, feverishness, and other symptoms indicative of the invasion of the general disease occur. By the tenth or eleventh day the pustule is fully developed, and at this time the variolous rash, or an eruption at some points away from the place of the insertion of the original matter, appears. By the fourteenth day the inoculated pustule has dried up into a crust, and the general eruption, which is usually scanty, in time gradually subsides. The system, with the exception of the rare cases referred to, becomes protected against any future occurrence of the disease.

When Variola is taken in the usual, or, as it is called, "natural" way, from inhalation of particles of poison in the air, the period of incubation is longer, generally from ten to sixteen days, usually twelve days. The disease may be taken from a small-pox patient at any time from the first invasion until the separation of the last scab, and longer if the clothing be not all changed, destroyed, or perfectly disinfected, and the body, including the hair and all the appendages that may harbor any particle of the poison, thoroughly cleansed. The largest amount of the poison, however, is thought to be given off about the period of the maturation of the pustules, and the danger of communicating the disease at that time is greatest.

The incubative stage of natural small-pox is almost invariably unattended with appreciable symptoms. In rare cases, however, the patient suffers from some vague feelings of illness, such as languor, peevishness, and moderate uneasiness. The invasion is comparatively sudden, and marked by the usual febrile phenomena—rise of temperature, sensations of rigors, and heat—and differs from that of most other fevers by the frequent occurrence in the adult of copious perspiration. Severe stomach sickness is very often present, with anorexia, thirst, constipation in the adult, but often diarrhœa in children; headache and pain in the limbs; and almost invariably intense pain in the lumbar region of the spine; drowsiness is often present, and not unfrequently delirium, stupor, or even coma; and in children there are apt to be convulsions. The headache is usually decidedly greater than that which accompanies the access of most other fevers, and maniacal excitement sometimes occurs. The most characteristic perhaps of the symptoms enumerated is the severe pain in the back. These lumbar pains are almost always decidedly out of proportion to the other symptoms (unless it be in some cases where the headache is equally severe), as compared with other febrile attacks without special local disease. The vomiting often occurs in many other febrile attacks, especially other eruptive fevers, as scarlatina, etc., and is not always present in attacks of small-pox, and constipation is too common a symptom to be specially characteristic of any disease. It is well to bear in mind the perspiration as aiding in the diagnosis, and yet it is not always present; and the convulsions, though not unfrequent in children in other cases at the commencement of a severe febrile attack, may, with other symptoms, throw a ray of light upon the obscurity which is often present at the beginning of the disease, before the characteristic eruption makes its appearance. The temperature in this stage of invasion usually rises rapidly to 104°, or even 105.5°. The urine is febrile, and in one third of the cases is albuminous, and may contain casts and blood; this latter condition may continue during the active disease, but is commonly transient; and very seldom does permanent disease of the kidneys with its results occur.

The sweating during this stage, so common in the milder forms of variola, and generally continuing more or less throughout its course, though much less conspicuous in the severer forms, is worthy of notice as a means of diagnosis. Special attention to all the early symptoms should be given in a suspected case, since the necessity of immediate isolation of the patient, to prevent the spread of this dread affection, renders an early diagnosis of great importance.

The symptoms of this stage are in a general way severe in proportion to the severity of the case they usher in; but yet I have seen very decided, in fact severe, symptoms—headache, backache, etc.—followed by a slight eruption, and a mild and even modified form of the malady. This, however, is not ordinarily the case, and high fever, great pain, and intense cerebral excitement are usually followed by the most grave after-conditions.

These general symptoms attain their greatest severity on the third day, when the eruption makes its appearance, and as it advances the fever abates, the pains diminish or cease, and in ordinary discrete cases great apparent improvement in the general condition takes place. The eruption, though very generally appearing on the third day, may, especially in violent and speedily fatal cases, manifest itself on the second day, and in still other cases may be delayed to the fourth, and even later. In modified small-pox, where vaccination has been imperfect in its results, and has afforded only a partial protection, it is not unusual, with other irregularities, to find the variolous eruption preceded by a rose-colored efflorescence somewhat resembling the rash of scarlatina. In genuine or unmodified cases, threatening great severity and a very abundant eruption, there may be, on the second or third day, a patchy but diffused redness, with some swelling of the skin, especially of the face and upper part of the chest, etc., which very strikingly resembles the rash of measles, but which is the beginning of the variolous eruption in a thickly set papular form. In other cases an abundant *petechial* rash, chiefly about the sides of the chest and abdomen, and on the loins, will appear, foretelling the greatest danger. In all ordinary cases, however, the eruption commences on the third day, in the form of small red points, first visible on the face, head, neck, and often early on the wrists, and within the next two days successively appearing on the upper part of the chest, the arms, the rest of the trunk, and then, or sometimes a little later, and always less abundantly, on the lower extremities. These spots in a very short time become little prominences, hard to the touch, feeling like shot imbedded in the skin, but, carefully observed, they are found hemispherical or somewhat pointed; they gradually become larger, and in the course of two or three days on the point of each there appears a vesicle or minute blister, the whole being acuminated or cone-shaped. From this they go on increasing in area, the vesicles broaden and become more flattened, their contents, instead of being transparent, as at first, become milky; the central point, which at first was most prominent, has become comparatively depressed as the margins have increased; and about the sixth day of the eruption, and ninth of the disease, these vesicles become yellow pustules. In this transformation the central point, which was held down by little bands extending into the substance of the true skin, has often become more prominent by the giving way of these attachments, the pustules assume a rounded form, and now there is a marked increase in the inflammation that has been going on during their development. Each pustule is surrounded by an inflamed areola, the swelling at its base is increased, more purulent exudations are poured out, and the pock increases up to about the ninth day of the eruption, or twelfth of the disease, when the process of *maturation*, as it is called, is completed, the pock has attained its full development, varying somewhat, but usually about the size of a large pea. The inflammation now gradually subsides, the matter dries down and forms a scab, which in time falls off, leaving the marks already described.

The periods of development and maturation mentioned are those belonging to the eruption on the face and neck, where it is usually more particularly noticed. On the rest of the trunk, and especially on the lower extremities, it is later by a day or two in its progress.

The eruption is always more abundant on the face than elsewhere, particularly than upon the lower part of the trunk. When each pustule upon the face stands by itself, the case is called "distinct" or "discrete" small-pox. When the pustules run together on the face, though separate but near when papules, the case is called "confluent;" and there is the greatest difference in the severity and danger of these forms, the latter being much the more grave. In these confluent cases, patches of greater or less size present little or no appearance of the distinct pustules described, but a continuous surface of inflammation, swelling, and suppuration; and if recovery takes place, there is a continuous crust, and finally nearly continuous scar texture, with small pits thickly studded over the parts. The more distinct and the farther separated from each other, within a limit, the larger, as a rule, are the pustules.

It should be noticed that the fluid in a pock in the vesicular stage is not all contained in a single apartment or cavity, but in several, like the divisions of an orange, concentrating at the centre, and held down there so as to give the umbilicated appearance as the development advances. At this central point the true skin is so involved that a minute slough often results, and when the suppurative condition occurs, the attachment of this affected portion to the surrounding tissue often gives way, and the pustule then loses the umbilicated form which the vesicle retained.

A careful study of the description of the eruption of small-pox at different periods, and particularly of the early stages, is exceedingly important for the purpose of making an accurate and positive diagnosis, where the deepest interests of a whole community may depend upon a knowledge of the nature of a case. This study is rendered the more necessary as the disease in large country regions in many places so seldom occurs, that a physician for years in practice may never have seen a case, and pictorial illustrations of the disease are exceedingly rare. From the frequency of travel and the possibility of exposure, cases are liable to occur in any neighborhood; and the instances are not few where a diagnosis has not been made until many unprotected persons have been exposed and an epidemic produced. The effect upon the reputation and standing of the physician who should make such a failure can be readily imagined. Careful attention to the different points mentioned would render a mistake impossible in an ordinary case after the eruption was well established and at all advanced. A very early diagnosis, though not always easy, is exceedingly desirable. The eruption, especially in severe cases, extends to the mucous membrane of the mouth and throat, interfering with deglutition, and sometimes with respiration, and often seriously aggravating the sufferings and increasing the danger of the patient. Its appearances upon these surfaces and upon the skin are somewhat different.

The general symptoms in small-pox up to the time of the eruption have been described. The abatement of these symptoms, which then takes place in ordinary discrete cases, is likely to continue until about the period of the commencement of the maturation of the pustules, the sixth or seventh day of the rash, or the ninth or tenth of the disease, when what is called the "secondary" or "maturation fever" sets in with rigors, pain in the head and elsewhere, high temperature —105° F., more or less, and sometimes when fatal results are threatened, 107°, or possibly more—perhaps delirium, etc., lasting for three or four days, when, if the case be favorable, improvement takes place and convalescence occurs as the pustules dry down. After the fever of invasion subsides, and during the remission of the general symptoms, and while the eruption goes on, some inconvenience is felt from the soreness or itching of the parts, but less than might be supposed. The eruption on the mucous membrane of the upper alimentary and air-passages gives more or less inconvenience, according to the severity of the case. There is salivation, the voice becomes hoarse, a cough may occur, with difficulty of swallowing, etc. In the more mild cases these symptoms may be nearly or quite absent; and in still milder forms of the disease, which are not unfrequent, the secondary fever is slight, or nearly or quite absent; and the eruption soon dries down with little or no suppuration, and convalescence soon ensues.

In confluent cases the course of events is quite different from that of the discrete variety just described. Instead of the marked change in the general symptoms when the eruption appears, there is comparatively but slight abatement of the febrile phenomena—severe symptoms continuing, and with still greater aggravation, as the maturation process commences and progresses. The fever, during this time, varies in its particular phenomena in different cases. Sometimes the excitement is high, the delirium active, restlessness great, etc. At other times, and more frequently, a lower and more typhoidal condition ensues. The pulse is feeble, but generally rapid, low muttering delirium is present, subsultus occurs, and, not unfrequently, extreme depression, collapse of the eruption, coma and death result. In these confluent cases the eruption in and about the throat is commonly abundant, adding to the distress and danger. When the patient struggles through this formidable type of the disease, the symptoms attain their maximum height with the completion of the maturation process, and then, with more or less continuance and fluctuation, abate. The face, during this process, has been greatly swollen, the lineaments of the countenance obliterated, and now a continuous and generally dark crust forms over the confluent eruption on the face, the pustules on all parts of the body dry down, and, during this desiccation, there is commonly great itching, and the patient, especially if a child, needs watching and restraint to prevent violence to the parts by scratching, which might induce ulceration and greater disfigurement.

While these processes are going on, a peculiar odor is exhaled from the patient, quite characteristic of the disease, and with this, doubtless, contagious particles are associated.

The loosening and falling off of the scales usually takes place during the third week of the disease; but the complete healing of all the sores, especially if any physical violence by scratching has been inflicted, may require a much longer time, and repeated crustings may appear.

The great difference in the symptoms, course, and results of the disease, as appearing in the clearly discrete and in the confluent forms, even when the confluence is limited to a moderate portion of the face, is quite remarkable and not easily accounted for. The prognosis in a discrete case is generally favorable, while in a confluent one it is always grave; and the fact of the confluence which is to take place can be judged of by the thick studding of the eruption in the early papular form. An early prognosis as to severity can usually be made by observing the character of the initiatory fever, and the abundance of the early eruption.

In the foregoing account a description has been attempted of the ordinary uncomplicated forms of small-pox; but unfortunately for brevity of description and a ready and complete understanding of the disease, all cases do not follow these types, and there are varieties and complications to be noticed.

In some cases, after the maturation is completed, instead of a subsidence of the symptoms and convalescence, various secondary conditions or complications arise which protract the morbid state or prove fatal. These are much more likely to occur in the confluent forms, but may also happen in the discrete.

During the third or fourth week boils may appear on different parts of the body, and then, or later, larger suppurative points may make their appearance, sometimes subcutaneous, at others more deeply seated; and occasionally they rapidly attain large dimensions. These processes may be accompanied by distinct and characteristic symptoms of pyæmia, which may or may not prove fatal.

In other cases erysipelatous attacks of the face, head, or other parts occur, attended, perhaps, with pyæmic symptoms; and gangrene, more or less extensive, occasionally supervenes. Ophthalmia in other cases occurs, and often assumes a suppurative, ulcerative, or sloughing form, and the cornea is sometimes penetrated and vision destroyed. In other cases otitis follows with its consequences.

Internal inflammations, particularly of the pleura, and also of the lungs and bronchi, sometimes occur during the active stage of the disease, and may cause a speedily fatal result. At other times there are similar complications later, with rapidly suppurative tendencies.

Severe inflammation or œdema of the larynx and glottis may appear during the active stage of the disease, or occasionally later, resulting in suffocation.

In cases where the lumbar pains are unusually severe, the spinal cord may be so much affected that partial, or more complete but temporary, paraplegia takes place, with loss of control over the bladder and rectum.

Many varieties of small-pox are mentioned. We have already seen that some cases are particularly mild throughout, and it is sometimes with difficulty that the patient can be kept within doors and isolated. He has but little suffering himself, and is often remarkably indifferent to, or unconscious of, the danger to which he exposes others by his presence among them, not seeming to realize that the mildest case may propagate the disease in its severest forms. Other exceptional cases may occur, as already stated, where the usual symptoms of invasion are followed by very few pocks, which soon dry up and disappear. In still other exceptional cases, the disease appears in the usual way, and the pocks are numerous but discrete, yet at the period when suppuration usually takes place, the vesicles dry up. In neither of these cases is there any secondary fever, and recovery is speedy.

The discrete and confluent varieties have been sufficiently described. The term "malignant" is applied to cases of unusual severity, and where death often takes place without the common developments of the disease. In these latter cases petechiæ and vibices are apt to occur, with bloody effusions into the pocks, giving them a very dark color, which has caused the name of "black pox" to be applied.

A more distinct hemorrhagic variety of a very malignant character has rather recently been recognized in some epidemics and cases.

An idea of this form can better be given by a description of cases. A cadaver was brought into the dissecting-room of a large medical school from some unknown source, which in its external aspect presented slight puffiness of the skin of the face, and a moderately mottled appearance of the skin over different parts of the surface, some of the spots approaching in appearance petechiæ and vibices, but not fully developed. Nothing was recognized by those having charge of the matter indicative of contagion, and the dissection was proceeded with. On coming to the internal organs hemorrhagic appearances were discovered, and the bladder particularly was filled with blood. Suspicion was at length excited, but too late to avoid the exposure of a large number of persons, among whom so many were entirely unprotected, or but partially protected, that an outbreak of small-pox occurred. The disease appeared in its usual forms--mild, modified, discrete, and confluent—pursuing the usual courses ; but one case of the distinct hemorrhagic variety appeared. A young man, about twenty-three, in good health, and of correct habits, was seized with the usual symptoms of the invasive fever, of decided, but at first of no unusual severity. About the time the eruption should have appeared, a scanty mottling of the surface was seen, and some, very few, obscure petechial points. Vomiting had been severe and was continued, and moderate quantities of blood were now thrown up. Blood oozed from the mucous membrane of the mouth, and large quantities of blood were passed from the bladder. The fever was not high at this time ; there was pain in the head, but the mind was fairly clear ; the patient began to sink, apparently as much from the loss of blood and the persistent vomiting as from the poison, and died in two or three days after the hemorrhage commenced, and five or six days from the invasion of the disease. No post-mortem examination was held. This case was undoubtedly identical in character with the one which was the source of the contagion.

It is worthy of remark, that by prompt vaccination, isolation as far as possible, and other precautionary measures, the disease did not extend to a single case in the community, beyond those exposed to the first source of contagion. The lessons to be derived from all the facts in this interesting account are too obvious to require pointing out.

Small-pox occurring after vaccination, which has afforded a partial protection, is modified in its character, and is called "Modified Small-pox," or "Varioloid." It commences with the usual symptoms of the invasion of the disease in unprotected persons, and generally assumes the discrete form, but may, though rarely, the confluent, and still more rarely a malignant form sooner or later, for there is no absolute regularity in these cases; but usually about the time that the inflammation and fever of maturation should commence, the eruption begins to dry up, and but little or no fever appears. There is sometimes delirium, with other severe symptoms; but though there may be a degree of confluence of the eruption, suppuration rarely occurs; and though there is every degree of modification, very generally the cases are comparatively mild and devoid of danger. They are capable of communicating the genuine small-pox to unprotected persons, and the same precautions as to isolation, etc., should be observed as in other cases of the variolous disease.

The statistics of small-pox derived from small-pox hospitals are interesting in reference to **Prognosis.** They show that of persons of all ages and conditions received with the disease into such institutions, 6.5 per cent. of those who have been vaccinated perfectly or imperfectly die; of those having good vaccine cicatrices, showing that the vaccination pustule had gone through its proper stages, about 2.5 per cent. die; while of those not vaccinated at all, 37 per cent. die. In estimating the value of vaccination, it should be remembered that nearly all who are properly and repeatedly vaccinated until the system is no longer affected by the vaccine virus, are completely protected from the attacks of small-pox in any form; and that those who have been vaccinated, but who take the disease, have the mortality in their cases reduced to the minimum mentioned.

The statistics of the London Small-pox Hospital show that of discrete natural small-pox there was a mortality of 4 per cent., of semi-confluent, 8 per cent., while of the confluent there was a mortality of

50 per cent. As to age, the lowest rate of mortality is between five and twenty. Under five it is much greater, and above thirty greater still. Children under one year very seldom recover, and patients above sixty are said never to recover. Pregnant women generally abort and die; and the fœtus is often visibly affected with the disease. In rare cases the pregnant woman, whether aborting or not, recovers.

The **Morbid Anatomy** of small-pox is such as the clinical history would suggest. The blood, in most cases, is dark and imperfectly coagulated, though fibrinous clots may be found in the heart. In the malignant or hemorrhagic forms, extravasations of blood may be found beneath serous and mucous surfaces, and into the cavities of hollow organs. The heart may be flabby, the liver pale and softened, and the spleen, so susceptible to changes in all fevers, may be soft and pulpy. The tongue is usually covered with a thick coat, which may be detached in patches; and the palate, fauces, and often the larynx, trachea, bronchial tubes, and the nasal fossæ, are congested, filmy, and in points excoriated, showing that the eruption had appeared upon them. When the bronchi are much involved they are loaded with mucus or muco-purulent matter, and the lungs are generally congested and œdematous, and sometimes inflamed. In complicated cases the pleura and other organs may show evidences of inflammation and its consequences, of effusions, etc.

The anatomy of the eruption is peculiar, and has already been alluded to in accounting for the clinical appearances. The papules—the first form of the eruption—are due partly to hyperæmia and proliferation of the cells, or deposit in the tissue of the true skin, and partly to enlargement and vacuolation of the cells of the rete mucosum. The central distended cells of the thickened rete rupture and unite to form an irregular cavity. Into this and the surrounding vacuoles, serum and leucocytes exude from underlying vessels, and sometimes red blood discs are mingled with the other exudates. By the continuance of these exudations the pock enlarges, and at length pus is produced as the inflammation increases, and by this change the vesicle becomes a pustule. The umbilicated form of the vesicle, which is sometimes retained in the pustule, is due, as already stated, to the collection and attachment of bands in the centre, and the greater increase of the effusion in the circumference; the cuticle forms the anterior or outer wall of the vesicle, and the corium forms the posterior, while partitions run through from the centre to the circumference, constituting it a multilocular cyst throughout. The suppurative and destructive process does not necessarily affect the tissue of the true skin, and some pocks leave no permanent marks; but more frequently the skin is so involved as to produce more or less pitting.

Treatment.—The Preventive Treatment of small-pox, by far the most important, has already been suggested by the allusions to vaccination and isolation. The great remedy is Vaccination, or the production of a disease derived from the cow, vastly milder than small-pox in man when occurring in the natural way, but which is found, as a very general rule, to prevent the latter disease. This will soon be more particularly considered.

Over the essential processes of small-pox, when it occurs, the medicinal art has very little, and certainly no radical, control. When the poison is introduced into an unprotected system, it is almost certain to produce its effects and develop the phenomena we have so particularly described. Since we are unable to interrupt the course of the disease, our efforts must be confined to mitigating its severity, opposing any complications that may arise, and endeavoring to enable the patient to endure its effects.

A popular author says: "In the mildest forms of small-pox medicinal treatment is scarcely called for; in the severest it is useless, and indeed under any circumstances it has but little influence over the course of the disease." This is unfortunately too near the truth; but often symptoms may be palliated, and not unfrequently the scales of life and death are so nearly balanced, that the weight of a timely and judiciously applied therapeutic agent, though small, may turn them in favor of the patient, when without it they would fall the other way.

Treatment may, then, be as important in this as in many other diseases, and should receive the physician's best attention. The hygienic conditions of the sick-room should be carefully looked after. It should be airy, well ventilated, as free as possible from textile materials, scrupulously clean, and kept at a regulated temperature. Proper readily assimilated food should be regularly given, cooling drinks should be allowed, and the patient should be kept quiet and free from all annoyance. A simple diaphoretic mixture, as acetate of ammonia, spts. nit. dulc., with a small quantity of the syrup of ipecac., may be given, the bowels opened if constipated, and the discharges checked with opium, turpentine emulsion, or some other agent, if a diarrhœa occurs and is excessive. When there is much pain and restlessness, anodynes and soporifics may be required; and any of the palliative measures adapted to most other severe fevers may be resorted to as the conditions require. These obvious indications and simple means for their fulfillment, all are agreed, should receive attention. Should anything more be attempted for the purpose of modifying more decidedly the specific morbid processes? This question will be variously answered by different authorities. It should be borne in mind that though the poison of small-pox is specific and always essentially the same, yet its effects, at least so far as degree of morbid action is concerned, are very different in different cases, depending upon some different conditions, certainly, of the systems upon which it operates. The answer to the first question will depend upon the answer to this: Can anything be done to alter the conditions of the system so that the morbid processes will take a milder form, or be better borne by the patient? From our knowledge of the powers of therapeutic agents, and from the analogies of other diseases, it does not seem unreasonable that this question should be answered in the affirmative. From the great variety in the character and severity of the morbid processes, and in the powers of endurance of the patient—the impossibility of knowing what would be the result without treatment in any given cases—the actual influence of any measures upon ultimate results is exceedingly difficult to determine. It must remain a matter of judgment and opinion rather than of demonstration, until some means have been applied more effectual and more decisive in results than any that have hitherto been used. From my own experience in the disease, both in private practice and in a small-pox hospital or pest-house, extending in all to a few hundred cases, I believe that certain remedies do have some effect upon the severity and fatality of cases. The treatment I have come to employ is something as follows: In addition to the simple measures already pointed out, in cases threatening severity I have given, in the earlier periods of the eruption, the chlorate of potash, or chlorine water, or the sulphites, and in some instances carbolic acid. Watching their effects, I have endeavored to avoid giving these antiseptics in any quantity which should disturb the stomach or do injury to any of the functions of the body. Soon, in anticipation of the suppurative process and the exhaustion following it, I have given the tinct. ferri chloride, and persisted with it until convalescence was established. During this time the nutrition has been kept up as well as possible, not so much by an abundance as by a proper selection of food regularly given. Of course death has not been averted in all the cases of confluent small-pox. But it has seemed to me that the severity of the disease and the number of fatal cases have been diminished by this course. This is, however, a matter of opinion and judgment, and, as stated, cannot be demonstrated until results are more uniform. In some cases quinine has been added to the iron; and with my present views of the action of that remedy, I should be inclined to use it more freely and in a larger number, if not in all the cases. One of the great dangers in small-pox is the extent of suppuration that occurs, exhausting the already enfeebled vital powers. According to reported experimental observations upon animals, and my own clinical experience, quinine strongly tends to diminish suppurative processes; and if this be so, there seems a clear indication for its use in cases where suppuration is so extensive and exhausting. While operating in this way its effects upon the system in other respects are not likely to be injurious. On the contrary, it tends to abate the excessive heat so often present, and sustains rather than depresses the vital actions. In order to produce its full effects, from three to five grains should be given once in from three to four or six hours, and if well borne, continued while the suppurative danger lasts. The antiseptic remedies may be continued or not as judged proper.

It will be observed that quinine has been recommended or suggested in most of the specific diseases we have been considering. This has not been done in a mere routine way, but from carefully considered pathological and therapeutical facts and principles, and from the results of experience. Whether judiciously or not, it has not been advised thoughtlessly. If it has the powers I believe it to possess, it is applicable to all similar conditions in the different diseases, and has not been mentioned too often.

Various other palliative measures than those already referred to may be of use in managing a severe case of this disease. The soreness of the throat may be relieved by warm bland drinks, and perhaps by some astringent or gently stimulating applications. Opium is not only useful in assuaging severe pain and procuring rest, but in the secondary fever, especially when combined with quinine, it mitigates its severity, and, properly managed, enables the patient to endure better the shock of the extensive cutaneous disease. When collapse approaches or occurs, ammonia and alcohol are suggested, and perhaps should be given; but the patient who is not kept from collapse by a proper diet—milk and farinaceous gruels, beef-tea, etc., often and regularly given—and by quinine, iron, and opium, will very seldom be aroused from it by any agents.

Various methods of local treatment have been recommended for diminishing the cutaneous suffering, and the deformity following. Protecting the face from the light and air by some metallic foil, or by various other substances, has been advised and practiced, but without very important results. Some have recommended puncturing the vesicle, washing away its contents, and touching the bottom of the cavity with a point of nitrate of silver. The application of strong carbolic acid has also been advised. Experience, however, has not caused the profession to attach much importance to any of these methods; but as, when carefully used, they will probably do no harm, a trial of them need not be discouraged.

Washing the surface from time to time with warm water, and keeping it anointed with carbolized oil applied with a soft brush or feather, is, perhaps, as well as anything that can be done. Great attention to cleanliness is important; and, toward the decline of the disease, great care is necessary to keep the eyes from being affected by the discharges, and the various mucous orifices from being irritated by them.

In the malignant and hemorrhagic forms of the disease, no treatment has been found efficient. So far as I have seen the report of cases of the peculiar hemorrhagic variety, illustrations of which were given, the death of the patient has been uniformly recorded. Still, efforts at relief should be made, guided by general principles.

The various complications which occur in the variolous affection must be treated as each case may demand. They are for the most part inflammations, acute, severe, and rapid in their course; and as they are much more likely to occur in the severest class of cases, their additional weight generally crushes the patient. Though they are acute inflammations, they occur in a shocked and depressed condition of the system, and require soothing and supporting, rather than depressing measures. Quinine and opium, here as in other inflammations of similar character, are the great remedies, or at least those which afford the most hope of relief. The erysipelas and the suppurating conditions which occur as sequelæ to the eruption stage, require the ordinary treatment for such inflammations, and for the pyæmic fever so likely to accompany them. Care as to exposure, and sometimes a tonic course of treatment, are required during convalescence.

COW-POX.—Vaccina.

This is a disease which occurs in cattle, is contagious by inoculation, or the introduction of lymph produced in one animal into the skin of another, and is also communicable to man by the same process. The prevailing opinion now is, that it is identical with small-pox in man—was originally communicated from man to cows, and from cow to cow by the act of milking—that it is, in fact, small-pox modified by the peculiarity of the bovine system, and rendered vastly milder by such modification; and that on the principle that contagious diseases usually occur but once in the same person, it prevents the recurrence of the disease (small-pox) in the human system once fully affected by it. The facts and arguments sustaining this conclusion seem to me sufficient, but it is not deemed necessary to detail them here. The important practical fact is now beyond any dispute that the vaccine disease, a mild affection imposing but little suffering and almost entirely devoid of danger, when thoroughly occurring in man, is, with rare exceptions, a protection against small-pox. This fact, so far as we have information, was first noticed, or a belief in it first entertained, over one hundred years ago among the dairy people of Gloucestershire, England. It is said a similar opinion was also entertained in Holstein, in a dairy region, and that a schoolmaster acting upon this belief vaccinated two children in 1771; while it is also declared that an English farmer in 1774 vaccinated his wife in order to render her insusceptible to small-pox, as others were observed to be who had taken the disease from the cow through accidental abrasions in the hands when milking. This belief and these alleged facts arrested the attention of Edward Jenner when he was an apprentice to an apothecary or a ,surgeon—in other words, when he was a medical student—and inquiring into the matter, and instituting experiments in a scientific manner, he was able to publish to the world in 1798 the "discovery" which has immortalized his name, and has proved a greater boon to the human race than was probably ever before conferred upon it by any one man. The practice of vaccination has extended over the whole civilized world, and its value in preventing small-pox has been attested by general experience. If the practice of vaccination were universal and thorough, there can be no doubt that the small-pox would be completely extinguished. Wherever the disease now prevails, it can always be traced to the neglect or imperfection of vaccination.

The following tabular statement, derived from the records of the London Small-pox Hospital during twenty years, is illustrative of the importance of thorough vaccination:

Patients admitted with small-pox.	Numbers.	Mortality per cent.
1. Having one vaccine scar	2001	7.73
2. Having two vaccine scars	1446	4.70
3. Having three vaccine scars	518	1.95
4. Having four or more vaccine scars	544	0.55
5. Stated to have been vaccinated, but having no scar	370	23.57

The mortality where vaccination had not been practiced at all was thirty-seven per cent. Another fact within my own experience illustrates the value of vaccination in preventing the disease.

The Second Regiment of Michigan Infantry, when mustered into the United States service in the spring of 1861, to serve during our late war, consisted of the full complement of one thousand men, besides a number of officers, servants, laundresses, etc. Commencing with the colonel and his staff, and extending by companies to every soldier and other person, irrespective of previous vaccination, all connected with the regiment were vaccinated with ordinary humanized vaccine virus contained in recent crusts. It was found that between a quarter and a third of the young recruits—mostly from the agricultural population of the State—had never been vaccinated. Others had one and two scars, many of them indistinct and imperfect. Of the whole number seventy-five per cent. took the vaccine disease, and in a very large proportion of them it went through its regular course, showing that a large number who had been previously vaccinated were not protected from the recurrence of the vaccine disease, and were presumed not to be perfectly protected against small-pox. Very few were so much affected by the operation as to be kept from ordinary military drill, and but a single accident followed, one man having erysipelas some time after the vaccination. From recruits and officers' servants coming into camp afterward, and having small-pox in the barracks and camp, the whole regiment were repeatedly and thoroughly exposed to the contagion, but not a single one of the recently and properly vaccinated, not one of the thousand soldiers, or of other attendants, took the disease. Nothing could be more conclusive as to the preventive effects of vaccination than this experiment; and nothing could more clearly show the importance of revaccination as a test of the perfection and continued efficacy of former vaccinations. This instance alone goes far to justify the statement, that if vaccination were universally, thoroughly, and repeatedly practiced, small-pox would become extinct.

The vaccine disease in the cow and in the human subject has a character and course essentially similar, and it will be sufficient to describe it as it appears in the latter. It is of much importance that every one who expects to practice vaccination should be familiar with its features.

No specific change is observable at the point where the vaccine matter is inserted, until the end of the second or third day, and sometimes, especially if the matter be not very fresh, somewhat later. At first a small congested papule appears. This gradually increases in size; at length a little transparent effusion occurs, and on the fifth or sixth day, or a little later, the papule has become changed into a round grayish vesicle, with a somewhat depressed or umbilicated centre. By the eighth or ninth day it has become fully developed, and is a distinct and prominent vesicle, with a flat or a cupped (umbilicated) surface, and containing a colorless fluid. Very soon the contents of the vesicle begin to lose their transparency as pus corpuscles are effused into it, and now a red areola forms around, with swelling and hardness from exudations poured into the skin and subcutaneous tissue. This continues to increase for the next two days, the swelling being less toward the margin, and the areola attaining a diameter of from one to three inches. The pock in the meantime becomes somewhat larger, and its contents still more purulent. From the tenth to the twelfth day the pustule or vesicle begins to dry up, the surrounding inflammation subsides, and a mahogany-colored scab is formed, which has a circular form, a flattened surface, generally with a slightly depressed centre, and which after a time, usually the twentieth day or later, falls off, leaving a cicatrix slightly depressed, with little pits on its surface arranged in a circular or oval form.

At the time of the development of the pock, and when the areola is about to appear, moderate and sometimes quite decided febrile symptoms occur, the glands above the seat of the pock are apt to be enlarged, tender, and somewhat painful; and sometimes a rash with a few small vesicles appears upon the limb around the seat of the operation, and occasionally extends to other parts of the body. In rare cases erysipelatous or other cutaneous affections follow vaccination, which are commonly attributed either to the insertion of impure virus or to a previous unhealthy condition of the system.

Unless the vaccine eruption from humanized virus presents the appearances and pursues the course above described, there is suspicion of its genuineness, and the operation with new matter should be repeated.

When vaccination is performed directly from the cow, the progress of the eruption and its appearance may be somewhat modified, and both the local and general symptoms are more severe than from humanized lymph. By some its protective power is regarded as more certain, and the danger of communicating human diseases, however much or little that may be, is certainly avoided. There are now facilities for obtaining bovine lymph in this and most European countries, and there is a popular demand for vaccination with this virus. It is, perhaps, important to return occasionally to the original source for the lymph; but when it has been transmitted only through healthy persons, free from specific diseases, and is taken from a perfect vesicle at the proper period, the humanized virus has all the properties that can be desired. No success with bovine virus could be more satisfactory and perfect than that of the army experience referred to. If the vaccination be performed at several points, and the operation, after a time, be repeated until the susceptibility of the system to its influence is exhausted, the protection from small-pox, if not absolute, is about equal to that from the disease itself.

It is thought by many that the protection, though perfect at first, may in time be lost, especially when the operation is performed in infancy. Whether this be so or not, as a test of continued or present protective influence, revaccination should, by all means, be insisted upon. The fact of a partial "working" of the matter in revaccinations is not a positive proof that the person, if exposed to the small-pox in the usual way, would have taken the disease. Vaccinated persons who have been repeatedly exposed by attendance, as physicians and nurses, upon small-pox patients without effect, may nevertheless be affected to some extent by the insertion of vaccine virus. One, however, should not feel safe until the vaccine virus will no longer produce any of its specific effects.

In cases of revaccination, one of three effects may follow. If the person be fully protected, not only from the contagion of small-pox, but from that of vaccine matter, no effect beyond a little local irritation from the prick of the lancet and the introduction of a foreign matter will take place. If no protective influence exists, the typical pock will be developed; but if there be merely impairment of the protection—if it be incomplete—a modified result follows. In this last case, the local effect is likely to come on early, and it may produce only a papule, which in a few days will disappear; or an acuminated vesicle may form, attain its full development on the fifth or sixth day, and then dry down, forming a scab which will soon fall off. In some cases, while these changes are going on, the local and constitutional irritation is as great, or even greater, than where the vaccine disease is perfect.

Other circumstances may modify the result of vaccination—such as the health of the vaccinated person, and the immature condition of the pock from which the lymph was taken; but when it is to any material degree modified, the result cannot be regarded as satisfactory, and the operation should be repeated.

The anatomical structure of the vaccine pock is essentially the same as that of variola. The vesicle has the same arrangements as to apartments, and the little pits left in the cicatrix mark the number and situation of these divisions.

That there are some dangers attending vaccination cannot be denied. Erysipelas of a severe grade resulted from the vaccination in one among the thousand soldiers referred to, although the same matter was used for all. This and other cutaneous troubles occur in some, from the insertion of matter that in other persons produces no such effects. In other cases matter taken from persons subject to eruptions or other impurities of the system, may produce irritations that may be accompanied by various unpleasant effects; our knowledge on this subject, however, is very imperfect. Lichen, eczema, and impetigo, diseases very common in children, sometimes follow vaccination, as they do other local irritations; but there is no evidence that these diseases are inoculable, or in such cases are communicated on the principle of a contagion. That syphilis may be communicated by inoculating with the blood and other matters of a syphilitic person there is no doubt; but the cases where syphilis has been communicated by vaccination are exceedingly rare, and these have been the result of ignorance or carelessness. There is to my knowledge no evidence whatever that the conditions which are vaguely called scrofula are thus communicated. Still, great pains should be taken to vaccinate with lymph *known* to be from a healthy person, in order to avoid all apprehension and possible danger.

When an unprotected person has been exposed to small-pox, if vaccination is performed in time for the vaccine pustule to come to maturity before the period for the invasion of the variolous fever, the attack of small-pox will be prevented or modified according to the perfection of the vaccine disease. As the latent period of small-pox is usually twelve days, and the maturing of the vaccine vesicle occurs in nine or ten days, vaccination, if successfully performed not later than two, or perhaps three days after the exposure, will prevent the danger from small-pox.

If the person has been previously vaccinated, but fears are entertained that the protection is not perfect, revaccination should be performed; and as the pock of revaccination in a partially protected person attains its maturity two or three days sooner, revaccination within five, or possibly six days after exposure to the small-pox, may be of service in preventing an outbreak.

Vaccination should be performed at as early a period in life as possible, especially in large cities where small-pox is seldom entirely absent; and everywhere if the disease is prevalent or threatened. Indeed, as a rule, every child should be vaccinated within the first three months of its life. It is desirable that it should be in good health, and free from any eruptive disease. In children or others, if the results of the vaccination are not *perfect*, the operation should be repeated; and however perfect it may be in children, it is now held by most that revaccination should be performed about the period of puberty. The method most common in Europe is from arm to arm; the lymph being taken from a vesicle about eight days after vaccination, though from the fourth day and onward, if there be transparent lymph in the vesicle, the vaccination will be effectual. The lymph taken at this period is often dried, and preserved on ivory or quill points, and dissolved into a puncture when the operation is performed. Sometimes the lymph is preserved in two parts of glycerine, and when thus kept in a vial it is ready for use. Better still, it is taken by attraction into capillary glass tubes, and when the extremities are hermetically sealed by melting in a lamp, the matter may be kept for a long time in a good state of preservation. An undisturbed pock dried upon the part, forming a clear mahogany-colored, circular, or slightly oval crust, and this crust, preserved from heat and air, and a small particle of it moistened and reduced to a lymph state by a minute quantity of water, just before using, furnishes a convenient and effectual form of the virus for ordinary use in vaccination. This is the method most commonly practiced in this country. The sooner the scab is used after it has fallen, the better, for in time it loses its efficacy; and yet it often preserves its activity for months, even when imperfectly protected. In the vaccination of the regiment referred to, the scab, or rather several scabs successively, were moistened and rubbed between pieces of glass until reduced to a thickish lymph or semifluid mass; and after a small puncture or a few scratches were made with the point of a lancet, a particle was taken on the point of the instrument and inserted into the wound of the skin. This, or something like this, is still the most common method of procedure, especially in country practice. The operation is usually and most conveniently performed on the outer and upper part of the arm, near the insertion of the deltoid muscle. The skin being drawn so as to be made tense, not less than three punctures should be made, at least half an inch apart, and of sufficient depth in the skin to open some small vessels and start a little blood. If the bleeding is at all considerable, as it should not be, a little time must be taken to allow it to cease. The virus should then be introduced, and the part undisturbed until the speck of blood that will ooze out has dried upon it. Different particular methods—a single oblique puncture; a series of short, fine, cross scratches, rubbing the lymph into them after the little oozing of blood has been wiped away, and still others—are practiced, the object of all being to secure the application of a particle of the virus to a raw and absorbing surface, and to prevent its removal either by the flow of blood or any mechanical means. In conclusion, it may be repeated that early, universal, and repeated vaccination is demanded for the extinguishment of one of the most terrific and dangerous pests that has afflicted the human race.

CHICKEN-POX.—VARICELLA.

This is a mild, contagious, eruptive fever, characterized by the occurrence of small red spots upon the skin, often coming in successive crops, usually sparsely scattered, which soon become papular and then vesicular, and which in two or three days dry down into scabs, that in a few days fall off, leaving a red spot which at length fades; while in rare cases minute superficial pits remain.

This disease, trivial in itself, is chiefly interesting from its resemblance and relations to small-pox, with which it has often, both theoretically and practically, been confounded. Notwithstanding some of high authority, as Hebra, regard it as a modification of small-pox, it seems as clearly distinct from it as other specific diseases are from each other. Though both are alike contagious, the poison being communicated through the air, the one is not taken from the other; and though the occurrence of each prevents the recurrence of its like, they have no influence in preventing each other: and further, though the eruptions have a slight resemblance, they are different in their anatomical features, and widely unlike in their course.

The chicken-pox is so common an affection among children, it is so familiar not only to the profession but to the people, it is so benign in its character, and requires so little attention as to treatment, that only the briefest account of it is here required. Its symptoms and progress, and the peculiar character of the eruption, need to be borne in mind in order to certainly distinguish it from small-pox; for if the latter should be regarded as chicken-pox, the gravest consequences in the spread of the disease might follow; while if the reverse should occur, unnecessary alarm would be produced; and in either case the reputation of the physician for professional knowledge and discrimination would suffer.

By calling to mind the phenomena of small-pox and the order of their occurrence and those of chicken-pox, the diagnosis ought not to be difficult.

The period of incubation may not be different. In small-pox it is about twelve days; in chicken-pox it is more uncertain—is placed by authors from one week to seventeen days.

The invasive fever is severe in small-pox, and lasts three days; that of chicken-pox is usually slight, and precedes the eruption but a few hours. The eruption in small-pox appears first about the face and neck, and is always most on the face; that of chicken-pox is generally first and most on the trunk, back, and chest, and sometimes the face escapes. In small-pox the eruption becomes distinctly papular, early feeling like shot under the skin; in chicken-pox much less so. In small-pox the papules gradually increase, and vesicles appear on the point in two or three days. In chicken-pox the papules are very slightly developed, and vesicles, though sometimes delayed for twenty-four, or even thirty-six or forty-eight hours, generally appear in a shorter time, often in a very few hours. In small-pox the vesicles, at first pointed, soon become broader, flattened, and before long umbilicated; in chicken-pox they are more like simple, small blisters, often irregular in outline, flattened but seldom umbilicated, and are on a less elevated base. In small-pox the vesicle goes on increasing to the eighth or ninth day, when it becomes purulent, and the maturation fever occurs; in chicken-pox the vesicles attain their full size in a day or two, then become milky, and shortly after dry down and form scabs. In small-pox the eruption, appearing first on the face and neck, gradually extends downward on the body, and appears on the lower extremities about two days later; in chicken-pox no such gradual extension takes place, but frequent successive crops of the eruption appear, each passing on in its stages like the first, which has been described. In small-pox, as maturation occurs, a secondary fever sets in; but the subsequent course need not be traced, as there is nothing corresponding with it in chicken-pox. The patient, in the latter disease, convalesces almost immediately, unless successive crops of the eruption appear; but when this takes place, the convalescence is seldom delayed longer than a week or ten days.

In some cases of very mild or of modified small-pox there may be more obscurity and difficulty of diagnosis, but a careful comparison of the symptoms and a close observation of the exact character of the eruption, will be sufficient to make it clear.

No important complications or sequelæ of chicken-pox occur, but sometimes the patient is left for a time in a debilitated state.

As to the treatment, little need be said, since scarcely any is required. Confinement to the house, possibly in more severe cases a saline laxative or a mild diaphoretic may be useful; and, if debility follows the attacks, gentle tonics or a change of air may be needed.

MEASLES.—Rubeola (Morbille).

This is a contagious exanthematous fever, characterized by a peculiar ruby-colored eruption appearing on the fourth day of the fever, and by a catarrhal condition of the respiratory membrane, congestion of the conjunctivæ and lachrymation.

There is no disease which gives off a contagion more promptly, or at an earlier period of the attack, or which is more likely to affect unprotected persons within its sphere of influence. The poison appears more volatile than that of small-pox or scarlatina; it is given off freely the first day of the fever, and is not likely to be retained so long about the patient or in fomites. As with other contagious exanthems, one attack generally protects against a subsequent one, though exceptions to this are more frequent in measles than in the other similar diseases. Now and then a second attack, and even a third, is met with.

It sometimes appears in a sporadic form, but generally has its periods of prevalence, and not unfrequently occurs in more widespread epidemics. It is more frequent among children, since from its ready contagiousness few escape exposure until more advanced life.

The latent period of measles varies—the limits probably being from seven to twenty-one days. It may be communicated by inoculation with the nasal mucus, when the symptoms are said to occur on the seventh or eighth day; but when taken in the usual way, through the air, the disease does not usually appear before the twelfth or fourteenth day. There may be slight indisposition during the period of latency, but generally there is not, and the attack is abrupt, beginning with catarrhal symptoms, and a moderate fever manifesting the common phenomena of the febrile state. The mucous membrane of the nose particularly is early irritated, sneezing commonly occurs, and sometimes epistaxis and a thin mucous secretion takes place. The irritation of the mucous membrane rapidly extends to the frontal sinuses, the eyes, the throat, larynx, trachea, and bronchial tubes, causing frontal headache, lachrymation, and intolerance of light, red patches upon the mouth and throat, and soreness, hoarseness, and a hacking cough. In children, convulsions sometimes accompany the attack; but in other instances, the general symptoms are so slight as not to attract attention. The skin is sometimes dry, but in other cases periods of sweating occur. Sometimes on the third day a remission of the febrile symptoms takes place.

On the fourth day of the invasion, sometimes as early as the latter part of the third, and in others as late as the fifth, the feverish and catarrhal symptoms increase, the temperature rising, but usually not to a great height. The heat at its maximum, which is at the period of the full development of the rash, is seldom above 103° or 104° F.; and now the eruption upon the skin makes its appearance, first on the forehead and temples at the margins of the hair, then spreading downward and invading the face, chest, and arms, and finally the lower part of the trunk and the inferior extremities. The hands and feet do not escape. Even before the rash appears upon the sink, a mottled or spotty redness may be seen upon the palate and fauces, indicative of the character of the disease.

Commencing on the fourth day, the rash usually attains its height two days later—on the sixth—though it may be three or four days in fully coming out; but soon after its complete development it begins to fade in the order of its appearance. In ten or fourteen days after, a fine, furfuraceous desquamation results, and no local traces of the disease remain.

When the eruption begins to fade the fever declines, sometimes to the normal standard of temperature, but usually to 101° or 100° F., where it remains for a day or two and then disappears. This outline history of an ordinary case may be varied in different ways. The inflammation of the mucous surfaces may become more serious, constituting a severe conjunctivitis; or may extend up the Eustachian tubes producing an otitis; or may follow down the air-passages, constituting a laryngitis, tracheitis, bronchitis of the larger or capillary tubes, and sometimes producing a peculiar catarrhal pneumonia. The measly catarrh sometimes extends to the mucous surface of the intestines, inducing a diarrhœa which may become dysenteric. The urine is febrile, and deposits often a sediment of urates, and sometimes at the height of the fever contains a little albumen. The chief pains experienced are from the frontal headache, the diarrhœal and dysenteric irritation of the bowels, and the inflammation in the ears. When young children appear to suffer from severe and continued pain, otitis should be suspected. Slight mental wanderings in ordinary cases may sometimes be observed during the eruptive stage, but marked delirium is unusual except in the more severe and typhoidal cases. In such cases coma and convulsions may occur, and when they appear in the eruptive stage are of more serious augury than when occurring at the period of invasion. The particular character of the eruption remains to be described. At its first appearance it has a dusky pink or ruby color, produced by hyperæmia of the cutaneous vessels—largely of the veins—but soon more or less exudation takes place into the tissue of the skin in spots usually set closely together, constituting slightly elevated papules, which increase in size until they attain, with the subcutaneous infiltration which occurs, a slight increase of elevation, and a line or two in surface extension. They are darkest at the centre, fading toward their periphery, and momentarily fade on pressure. At first they are separate, though commonly in groups, which are generally said to assume a crescentic form; but I have failed to recognize such distinct new-moon shapes as most authors would lead us to expect. In many cases when these spots attain their full size they run together, and as the elevation in some cases is considerable, the face is puffed up, and the ordinary lines and expressions of the features are obliterated. The spots at the decline of the eruption fade quickly, but the vessels are sometimes left in a relaxed condition, and dilate under various influences, causing an occasional flush of the countenance for some time after the disease is passed.

Occasionally the eruption is delayed, or after appearing is suppressed; the symptoms are apt then to be very seriously aggravated: but they are relieved on the appearance of the rash.

Measles, if without serious complications, is usually a comparatively mild disorder, the ordinary stuffy cough from the eruption on the air-passages commonly disappears with the subsidence of the other phenomena, and the convalescence is completed from the tenth to the thirteenth day. Sometimes the disease is very mild—only slight feverishness, and a scattered eruption occurring, with but a moderate degree, or the absence of catarrhal symptoms. In some epidemics and cases, however, the most grave symptoms occur at an early period—the tongue is dry and dark, the eruption sometimes scanty and almost black in color, or more distinctly petechial; delirium, subsultus, and other typhoid symptoms supervene, and the patient, collapsed or comatose, dies early.

At other times the inflammatory complications referred to, particularly of the air-passages and the lungs, render the cases most severe, and are the common causes of the unfavorable results which not unfrequently occur from this disease. When patients escape the first effects of the bronchial and pulmonary congestions and inflammations, sometimes a subacute or chronic disease is left, which is apt to result in the degenerations of consumption; and sometimes, especially in children, a troublesome diarrhœa is a sequel of an attack, from a continuance of the catarrhal disease of the intestines.

In the Morbid Anatomy of Measles there are no characteristic appearances of internal organs, and none other than those which the existence of the complications suggests. In the malignant forms, when the patients die early, the blood is found dark and imperfectly coagulated, and congestions (more commonly hypostatic) of the lungs may be found, and the spleen and other organs may be abnormally loaded with blood. Later on, as death then occurs from the complications, the evidences of such complications will be seen. These are most common in the bronchi and lungs, presenting, with some modifications, the appearances seen in fatal cases of bronchitis and pneumonia under other circumstances. These peculiarities will be referred to when the diseases of the respiratory apparatus are described.

Treatment.—The Prophylactic Treatment consists in avoiding exposure to the contagion. No other external circumstances or known internal conditions which can be induced or avoided have any ascertained influence upon its occurrence. When susceptible persons are exposed to the contagion they take the disease; and it is to be expected that, in communities, every one will, sooner or later, contract the affection. When in an epidemic or general prevalence the type of the disease is severe, great pains should be taken to isolate patients and protect the well by avoiding exposure. If the form of the prevalent disease is mild, such percautions are, to say the least, less called for. The disease is, perhaps, less likely to be severe in childhood, after infancy is passed, than in adults, and when well over with, more security is felt.

There is no known abortive treatment of the disease, and in ordinary uncomplicated cases pursuing the usual course there is no need of attempts to influence its progress. Symptoms, however, may be palliated, and in severe cases, and especially in complications, such palliation may be of essential consequence. Cases, therefore, should receive the attention and care of a physician, not necessarily to interfere with the disease, but to watch its progress and afford timely aid to the patient if required. In mild cases no medication will be called for. The ordinary hygienic conditions should be attended to, the patient kept in his room, and generally in his bed, and a light diet prescribed; the bowels should be prevented from being constipated; and it is common practice to advise some gentle diaphoretic mixture. I have usually prescribed the mixture of Liquor Ammoniæ Acetatis, ℥iijss; Spts. Nit. Dul., ʒjss; Syrup Ipecac., ℥j.—M. Two or three tea-spoonfuls to an adult, in a drink of water, once in from two to four hours. If there is great restlessness or much cough, a Dover's powder, or some other form of opiate, may be given as required. For children an appropriate (small) quantity of elixir paregoric may be added to the proper dose of the above mixture. If a moderate or tolerably free perspiration is kept up, but excessive heat is avoided, the eruption appears more readily. This is desirable since the measly poison, which is doubtless eliminated by the skin, is thus more freely gotten rid of, and the disease is perhaps rendered less severe and dangerous. If any of the complications which have been referred to arise, they must be met early and promptly by measures adapted to their nature. To describe here the treatment in detail for bronchitis, broncho-pneumonia, and pneumonia, would be anticipating what will be more appropriately stated under the head of those diseases. That treatment, however, might be modified by the measly state, but such modifications, if any should be rendered necessary by the other conditions, would be readily suggested to an intelligent medical mind. If there are abdominal complications, severe catarrh of the bowels, with diarrhœa, etc., they should be treated as in other cases presenting similar phenomena. In the unusual and malignant cases, where the system seems overcome by the poison of the disease, and especially if the eruption should not make its appearance at the proper time, elimination by the skin and irritation of the surface should be induced by diaphoretics, simple warm baths, mustard baths, sinapisms, or stimulating frictions. The shock to the system should, if possible, be abated by soothing measures, and the failing strength should be sustained. The internal remedies here suggested are opium, quinine, alcohol, ammonia, camphor, and warm drinks, as ginger-tea, hot beef-tea, hot coffee, etc. These articles may be variously chosen, combined or alternated, to meet the particular conditions apparent, and in quantities adapted to the age and other states. If confined to one of the above medicines, I should, as a general rule, select quinine as likely to fulfill more indications than any of the others. It tends, in proper free doses, to relieve internal congestions, excite diaphoresis, abate excessive heat, and sustain the vital energies, and it is more likely than any of the others to exert an antidotal influence upon the poison. Opium and alcohol have their claims for relieving shock and sustaining the system under suffering, and ammonia and camphor may be useful as stimulants and diaphoretics. Too much, however, must not be done, and a judicious selection of measures should be made.

In the typhoid forms a similar sustaining course will be called for; and in any of these conditions, if pneumonic inflammations are developed or threatened, in my judgment the full antiphlogistic power of quinine, alternated perhaps with ammonia, and modified often by morphine, should be brought into requisition.

GERMAN MEASLES.

EPIDEMIC ROSEOLA.—RÖTHELN.

An eruptive fever of mild character, bearing these and still other names, has been recognized, more particularly in recent times, and requires to be noticed. In many of its features it strongly resembles measles, and has often been confounded with it. It has, however, points of decided difference, is evidently not produced by the same poison, as the one is not taken from the other, nor does the one protect the system from the other, and the two cannot be regarded as specifically the same. It is believed to be contagious, and therefore to depend on a specific virus; but it is less so than measles—a larger proportion of persons who are exposed to those who have it escape its influence—and it has by no means as extensive and general a prevalence as the latter disease.

The incubative period is thought to be about a week; its invasion is often coincident with the rash, though not unfrequently there is slight indisposition for a day or two preceding the eruption; but it is always of short duration, and without distinctive characters. The rash usually appears first on the face, but almost as soon upon the extremities, and rapidly spreads over the surface. It commonly attains its height on the second day of its appearance, and disappears in the course of the next two, three, or, at farthest, four days. The rash has a striking resemblance in color and general appearance to that of measles, but it is not pretended that it assumes the crescentic form of grouping. These spots, when distinct, vary in size from a mere point to a line in diameter, and sometimes run together over considerable spaces. They are commonly but slightly elevated above the level of the skin, but sometimes, especially on the face, they are more papular in form. They appear upon every part of the body, but more thickly upon the face, forearms, wrists, and the lower parts of the legs. This eruption is attended with considerable itching, and is apt to be followed by a slight bran-like desquamation of the cuticle. The symptoms of coryza, so conspicuous in measles, are slight or absent, and are almost never a subject of complaint, though the eyes are generally red, and puncta, similar to those upon the skin, may commonly be seen in the throat. There is sometimes a little cough, and during the active stage of the eruption a slight degree of fever, but the patient often declares himself as feeling nearly or quite well; and the affection is without recognized complications or sequelæ, and entirely disappears within about a week.

As the disease is so slight and devoid of serious consequences, no particular medicinal treatment is required. If in an exceptional case the symptoms should be more severe, they might be met by the remedies for moderate fevers already so frequently mentioned.

"Straw Measles."—Within some years past an eruptive affection has been described as produced by musty wheat straw, and has been called measles. I have had the opportunity of seeing two cases occurring at the same time in lads who had 'been assisting in tending a threshing machine on an Illinois farm, where musty wheat stacks were being threshed; and the disease was evidently produced by the cryptogams upon the straw. The phenomena certainly resembled those of measles very strikingly, not only in the eruption but the symptoms of coryza; but it did not seem to me that the affection should by any means be called measles, as it was produced by the dust of the straw and not from a contagion, and was not communicated to other children in the family who had never had measles. I did not witness the premonitory symptoms or the full course of the disease. I only saw the cases in the height of the affection, when, without any history, I should have supposed it measles, and learned the fact of its not being communicated afterward. I fancy the cases were identical with the "straw measles" that have been described. The straw when threshed emitted much dust, which was irritating to all who inhaled it, but produced these peculiar symptoms only in the two lads mentioned.

I also witnessed in the army, during the late war, cases of fever, coryza, and eruption of a similar character occurring with soldiers, in those who had previously had measles as well as in others, where straw had been used in the tents as a substitute for beds. The affection usually subsided in a week or so without serious consequences.

SCARLET FEVER.—SCARLATINA.

This is an acute, contagious, specific, eruptive fever, marked by a high grade of fever, the early appearance of a bright red or scarlet-colored punctate eruption, and generally by inflammation and often ulceration of the throat—the eruption followed by desquamation of the cuticle; and not unfrequently as a sequel to the disease, by general anasarca, occurring as the result of a desquamative nephritis.

There can be no doubt that scarlatina is a contagious disease, and still many never take it though repeatedly exposed to those suffering from it in its worst as well as its milder forms. It occurs more frequently among children than adults, probably because those susceptible to it are commonly exposed in early life; and as in other contagious affections, one occurrence generally prevents subsequent attacks. The contagion of scarlet fever seems powerful and diffusive, and clings to rooms, clothing, and other fomites with great tenacity and for long periods.

The incubative period is uncertain, varying from one or a very few days to many, and the period after the attack in which the patient is capable of communicating the affection is also uncertain. The infectiousness, however, is believed to be slight during the first two or three days, increasing then as the rash and sore throat are developed, and probably continuing until desquamation is completed.

The degree of severity of this disease varies exceedingly, some cases being remarkably mild, while others are of the greatest severity and malignancy. Not only the degree but the character of the phenomena varies greatly in different cases; and though it has typical forms, such wide variations occur, that without lengthy descriptions it is difficult to give a correct notion of its different manifestations.

A primary division of scarlatina is into *Scarlatina Simplex*, and *Scarlatina Anginosa ;* in the former the throat escapes, at least with but slight congestion, and in the latter it is affected more seriously. There is another form more rare, where the faucial affection occurs, but where no characteristic eruption appears, and this variety receives the name of *Scarlatina sine Eruptione.*

In a typical case the invasion is sudden, usually marked by chills, vomiting, and soreness in the throat, soon accompanied by great rise of temperature, rapidity of pulse, dryness of the skin, languor, drowsiness, dizziness, headache, general pains, slight coating of the tongue, sometimes diarrhœa, and other symptoms of an acute pyrexia. Those most characteristic are the sore throat, vomiting, remarkable increase of temperature, and frequency of the pulse, the temperature rising to 105°, and sometimes higher, during the first day, and the pulse to 120, and in children often to 160 per minute.

On the second day the rash makes its appearance, first perhaps upon the palate, then upon the chest, and soon, often simultaneously, upon the forearms, lower abdomen, and thighs ; and in the course of twenty-four hours, more or less, it becomes general, attaining its full development in two or three days, or on the third or fourth day of the disease. At first the eruption consists of minute, slightly elevated, bright rose-colored points, separated from each other, but closely set ; and soon increasing in size and in redness they run together, giving the skin an intense scarlet hue and nearly uniform redness ; but still the minute elevated points of greater redness can be seen on careful inspection. Occasionally the papules on the side of the neck and chest become vesicular, and generally there is more or less infiltration and swelling of the skin. The vivid redness which marks the most typical cases is not always present. The eruption is sometimes pale and almost imperceptible, and where it is more marked it may be limited to the parts of the body where it first makes its appearance ; and when general, the redness is more intense on the chest, neck, abdomen, and inner part of the thighs, and, differing from small-pox, it is less marked upon the face. The feet and hands are often stiff with the eruption and its attendant œdema.

As the rash becomes fully developed, the other symptoms increase in severity—the heat is greater, the pulse and respiration are more rapid ; the tongue is at first coated, though soon the enlarged papillæ are likely to project through it, the coating begins to disappear from the tip, and in four or five days from the invasion the tongue presents the red, raw, or glazed appearance, with elevated papillæ resembling a ripe strawberry, so characteristic of the disease. The soreness of the throat in the common anginose variety increases, presenting a livid or dusky redness of the tonsils, the pillars of the fauces, the soft palate, and the uvula; all are more or less swollen, and present upon the surface spots of adherent secretion. This swelling, extending more or less to the glands in the region, is accompanied by pain, tenderness behind the angle of the jaws, and difficulty of swallowing. The general symptoms increase in severity; the muscular weakness increases; the patient is dull, stupid, slow in answer, often delirious; but the vomiting commonly ceases, and the bowels usually become confined.

From the fourth to the fifth day the rash begins to fade, and somewhere between the sixth and twelfth day of the disease, or from the fifth to the tenth day of the rash, it has disappeared. General improvement in favorable cases now occurs, though in others typhoid symptoms may make their appearance; the throat symptoms become more severe—the tonsils perhaps suppurating, ulcerating, or sloughing; or in other cases the urine becomes smoky and scanty, is found to be albuminous, and to contain blood and casts, showing implication of the kidneys; and sometimes this condition is accompanied with uræmic poisoning, and later generally with œdema and general dropsy.

As the rash disappears, desquamation commences, but continues from a few days to some weeks before completion; the cuticle peeling off in scales and patches, and sometimes upon the hands coming off like a glove. The implication of the kidneys with accompanying dropsy sometimes occurs earlier, but is more likely to manifest itself during or after the period of desquamation, and occurs as frequently after mild as after severe cases.

As already stated, scarlet fever varies much in the degree of severity and in the special character of its symptoms, and deviations from the more typical form of the disease already sketched very often occur. The terms Mild, Severe, and Malignant scarlet fever are convenient and are generally used to indicate the grades of severity, and other terms are used indicative of deviations from the usual forms of the disease.

Some cases are so extremely mild that the patient does not take to his bed, manifesting little or no illness, the inflammation of the fauces being slight and the eruption indistinct. In these cases the diagnosis may be difficult, and only to be made out by the prevalence of the disease and the occurrence of nephritis and dropsy as sequelæ. This variety is called Scarlatina *Latens*, and is of interest chiefly on account of the sequelæ, which are quite as likely to follow this as other forms.

Scarlatina Simplex—the fever and the eruption without any affection of the fauces, at least beyond a little redness—is rare, but still instances occur. Faucial inflammation without an eruption (scarlatina sine eruptione) not very unfrequently happens. In these cases there may be considerable or but little fever ; and some persons who have had the disease, have irritation of the throat and slight indisposition whenever brought in contact with those laboring under the affection. But the irregular forms are not all of a mild character. Some are exceedingly severe and speedily fatal. Others of irregular form are severe, but not extremely so. Hyperpyrexia and extreme frequency of the pulse mark some cases. In others, violent and repeated convulsions occur, from the intensity of the poison, and without the intervention of renal disease. In other cases there will be violent delirium ; and in still others the inflammation and swelling of the throat will be extreme, followed occasionally by extensive sloughing. In some of these severer cases the eruption is imperfectly developed or wanting, or is of a darker color than in the ordinary or typical forms of the disease. Malignant cases are those where the severity is so great that death occurs, or is imminent, in a day or two, or sometimes even in a few hours. Some cases succumb speedily from convulsions and coma. In these, the temperature may or may not be extreme. In still others, apparently overcome by the direct action of the poison, the patient falls into a state of stupor and collapse ; swelling of the throat may be present, but little or no eruption may appear ; and the diagnosis would be doubtful but for the prevalence of the disease at the time, and the exclusion of other causes for such violent toxæmic symptoms. Very rarely hemorrhagic cases occur, resembling the hemorrhagic small-pox before described. In these the temperature may be very high, petechiæ appear, and hemorrhage from other parts than the skin takes place. Grave cerebral symptoms accompany nearly all the extraordinarily severe and malignant cases ; and when such symptoms are present, other conditions are likely to be much varied.

Various complications—affections of a local character not necessarily belonging to the disease—are liable to occur. Among these are otitis, inflammation extending from the throat up the Eustachian tube, not unfrequently resulting in destruction of the tympanum, the discharge of the bones of the ear, and more or less loss of hearing ; entero-colitis in children ; inflammation of serous membranes, as of the peritoneum, pleura, pericardium, and endocardium, and of the fibrous structures about the joints, presenting the phenomena of articular rheumatism, but probably from a poison differing from that of ordinary rheumatic fever ; and all these sero-fibrous affections may be the result of imperfect elimination from the kidneys. Laryngitis, which may result in suffocation, gangrene of the mouth or noma, which may prove very serious, and coryza and ophthalmia, are still other conditions complicating some of the cases of this disease.

Diphtheria is said sometimes to present itself as an intercurrent affection, a membrane forming, not of a pultaceous character, like that produced by simple pharyngitis, nor of the character of the exudate usually produced in scarlatina, but the more firm structure characteristic of the diphtheritic state.

The disease of the kidneys, tubal and parenchymatous nephritis, so often accompanying scarlet fever, may be regarded as a complication, or as one of its natural results, though it occurs to any considerable degree in only a minority of cases. This disease of the kidneys, producing albuminuria, and generally dropsy, and not unfrequently uræmic poisoning, may occur while the scarlatinal disease is in progress; but it is more frequent after other symptoms have disappeared, and as a sequel to the fever. In some of these cases the disease of the kidney is acute and rapid, accompanied with an active fever, uræmic poisoning and its consequences, coma and convulsions; or dropsical accumulations come on speedily. In others, the kidney affection is more chronic, pursuing a slow and progressive course, the dropsy and anæmia being the more prominent symptoms. In some of these cases the symptoms are never severe and soon subside—the disease of the kidneys disappearing spontaneously in a manner similar to the disappearance of the rash. In others, there is greater severity and persistence; and, in rare instances, suppression of urine occurs, and a fatal termination follows. In the milder cases the inflammation is tubal and desquamative, while in the severer the inflammation often extends to the parenchyma of the organs, and occasionally permanent changes result. In these cases of disease of the kidneys the urine becomes albuminous and sometimes bloody, and casts of the uriniferous tubes are often found, but in very many of them this condition passes off without serious results. Not unfrequently, however, and perhaps oftener after mild than after severe cases of the primary disease, anasarca and uræmia result, which may be attended with severe headache, soon followed by eclampsia, coma, and death. The fatal cases from this cause are exceptional, and generally, under judicious management, the albuminuria disappears and the dropsical accumulations are absorbed away. But when the kidneys are more permanently affected, the albuminuria continues, and the dropsy may become excessive. Sometimes the dropsical conditions linger after the urine is no longer albuminous, and occasionally dropsy occurs where no albumen has appeared in that secretion. In such cases there will be anæmia from the previous blood poisoning.

Morbid Anatomy.—On *post-mortem* examination of patients dying of scarlatina, most of the internal organs appear to the naked eye to be free from decided changes. The liver and kidneys, however, may be somewhat softened, and the blood imperfectly coagulated, but still fibrous clots are sometimes found in the right ventricle extending into the pulmonary vessels.

In the "malignant" or rapidly fatal cases, hypostatic congestion of the lungs is sometimes found, collapse of the lungs may occur, and also hemorrhage into the substance or on the surface of internal organs. The throat, in the anginose varieties which have continued longer, shows signs of inflammation and ulceration, and sometimes of gangrene. The glands of the intestines, both the solitary and Peyer's patches, are somewhat enlarged. When death results from complications or the sequelæ of the disease, other gross changes are present, but they are such as occur in other than scarlet-fever cases, and will be described when the local diseases of the different organs are discussed. Recent and minute investigations have shown that inflammatory hyperæmia and proliferation occur not only in the skin, throat, mouth, and kidneys, but that the alimentary canal, the salivary glands, the pancreas, liver, lymphatic glands, and spleen show a tendency to similar changes. The endothelium and muscular coats of the small blood-vessels show germinations, with an accumulation of lymphoid cells in the tissues around. There is swelling and proliferation of cells in the rete mucosum, with serous effusion and migration of leucocytes between this layer and the epidermis, causing the tendency to the detachment of the latter. In the various epithelia, especially those of the renal tubules, changes resembling those in the skin occur; and in the interior of lymphatic glands, especially those in the region of the inflamed throat, there is said to be a disappearance of the lymphoid cells, and the appearance in their stead of giant cells containing many nuclei, which ultimately become fibrous. The kidney changes will be more particularly described when the various diseases of those organs are considered.

Diagnosis.—The differential diagnosis of scarlatina is to be made by comparing the phenomena with those of the diseases which it resembles. In ordinary cases this is by no means difficult, as the rapid and excessive rise of the fever, the early appearance of the peculiar eruption, the soreness of the throat, the early white coat, followed by the "strawberry" appearance of the tongue, are quite characteristic. The unusual forms, especially the malignant variety, where convulsions and death occur from the early blood poisoning, without the appearance of the eruption, or a full development of the soreness of the throat, are often obscure. The prevalence of the disease and the violence of the symptoms will, however, aid in the diagnosis, and on the whole it is as clear as in most other diseases.

Treatment.—From the great variety of phenomena presented

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One source of danger is the severe inflammation, ulceration, and sloughing of the throat. For this state of things various local applications are advised. A common domestic application is a thin slice of fat salt pork externally; and some of high professional authority advise it as among the best of external applications.

When the external glands of the neck are much swollen, poultices or water dressings may be used. As it is believed that the system may be re-inoculated by the poison produced in the throat, the application of antiseptics to the internal surface seems indicated. Most of the remedies recommended in diphtheria may be useful in scarlatinal sore throat, and they need not be particularly described here. The steaming, the gargles, the sprays, the swabbing, and the insufflations, as best adapted to particular cases, may be called for (see Diphtheria). I know of no general treatment more likely to be of service than that recommended for diphtheria—quinine and chlorate of potash, the doses of the former varied to meet the different conditions—antipyretic doses when hyperpyrexia is present, and antiseptic and sustaining doses in the suppurating and sloughing stages; and this article, in connection with the chlorate of potash, and perhaps other preparations of chlorine, is as likely to counteract or antidote the scarlatinal poison as any agents of which we have knowledge. Various other remedies, with reference to an antiseptic or antidotal effect, have been advised. The *liquor sodæ chloratæ*, preparations of carbolic and salicylic acids, permanganate of potash, etc., may be used locally; and chlorine, carbolic acid (one grain as a dose for an adult), salicylic acid (from six to fifteen grains for an adult) have been strongly recommended. A chlorine mixture may be prepared by putting eight grains of the chlorate of potash, pulverized, into a pint bottle, and pouring upon it a drachm of strong hydrochloric acid. The mouth of the bottle should be closed until the violent action has ceased, when small quantities of water should be added from time to time, and the bottle shaken until it is filled. The whole pint may be taken by an adult in a day, and by children in proportionate quantities. The sodium sulpho-carbolate has been very highly recommended, as in diphtheria; but it needs further testing; and the sulphites of soda and magnesia are thought by some to have a degree of controlling effect over the disease.

The cases of extreme severity, designated as malignant, when the system is speedily prostrated as by a narcotico-acrid poison, or when a hemorrhagic state is present, or when repeated convulsions and coma occur, offer little encouragement in the way of treatment. The tendency to death is so strong, and the course of the disease so rapid, that no remedies seem able to avert the fatal result. Some writers, in these extreme cases, especially when death is threatened by asthenia, recommend the free use of alcohol, but its good effects are at least doubtful, though in accordance with authority it may be tried. Ammonia, quinine, hot or mustard baths, sinapisms, warm drinks, etc., may be tried, as they are suggested on rational principles; and when hemorrhages occur, attempts to control them by styptics, ergot, etc., as in other cases, should be made. In violent convulsions, ether or chloroform by inhalation may be given; and whenever in any case there is a profuse diarrhœa, or great restlessness and pain, opiates, as in other diseases, will be indicated. The treatment of the albuminuria and dropsy occurring as sequelæ, must be conducted on the same principles as in other cases of acute nephritic affections. The skin and intestines must be made, as much as possible, to do the work of the disabled kidneys—diaphoretics and cathartics must be used as they can be borne; dry cups may be applied over the region of the kidneys; the warm bath or warm pack repeatedly used; cream of tartar water should be given as a drink, the jaborandi as the most effective diaphoretic, and such hydragogue cathartics administered as the strength of the patient and the condition of the intestines will justify. Later, for relieving the anæmia and debility so likely to be present, tincture of iron and other tonics may be demanded.

The otitis and other complications and sequelæ must be treated as they would be when occurring in other cases, taking into account the condition of the system, as produced by the scarlatinal disease, which is generally that of debility and exhaustion.

EPIDEMIC CHOLERA.

ASIATIC CHOLERA.—CHOLERA ASPHYXIA.

This is an infectious and epidemic disease of great severity and fatality, which has probably existed for a long time, and has prevailed in the Eastern world to an unknown extent; but as far as known in modern times it originated in India, where it appears to have existed as an endemic affection for an indefinite period; but in other parts of the world it has only made visitations as an epidemic. Its history has been known to the civilized world only since 1817, when it commenced its march from the delta of the Ganges. During the next fifteen years it spread over a large portion of the globe. It traveled northwestward through Asia and Europe, and reached our continent in 1832. It appeared again in 1834, when it disappeared until 1849, when it repeated its visits, and during that and the subsequent years of 1850, '51, and '52, it prevailed in many localities, and came under my observation and care in Chicago during the three last-named seasons, and also, but to a less extent, in 1854. It made its appearance again in 1866, and during that and the subsequent year, it visited many of the larger towns in different States, but its prevalence was not so extensive as on the former occasions. In 1873 it was again introduced into this country through the agency, as was supposed, of the mercantile marine, but its prevalence was less than on any previous visitation.

Having seen much of this disease as it prevailed in Chicago in 1851–1852, and 1854, and especially in 1852, when a very large number of emigrants from Europe and others came under my charge as city physician, having witnessed the introduction of the disease and watched its spread, and having had under my personal care and treatment in a cholera hospital and the homes of the patients many hundreds of cases, I may be permitted to express individual opinions very strongly entertained, without so much reference to the views of others and the literature of the profession on the subject as might otherwise have been required. My opportunities of experience in its treatment (commenced both at an early and more advanced period of the disease) were exceedingly ample ; and taking charge of a large number of cases as they came under municipal control, after being under the care of numerous other physicians, I witnessed the methods and results of a great variety of treatment, and formed opinions on that subject particularly, which subsequent study has not induced me to change.

The literature of cholera is very extended ; and even an outline of it would extend this article beyond the limits necessarily set for it. An account of the disease will, therefore, be limited to a brief statement of what are believed to be its causes—essential, predisposing, and accessory ; of its phenomena, symptomatology, and pathology ; and a more particular account of its treatment, prophylactic and curative.

Causes.—Although the specific entity of the cholera cause has never been identified and demonstrated, yet the exclusion of all other conditions as causes from the great variety of such conditions under which it appears, seems to leave nothing for our acceptance but a belief in a subtile material substance—a cholera poison. As no disease can occur without an antecedent producing it, and no specific, identical, and definite disease without a more or less specific cause operating upon or within the organism, we are at once forced to the conclusion that a disease like cholera, distinct and essentially identical in its character wherever it appears, far-spread and migratory, affecting alike a great variety of persons in different conditions and under diverse circumstances, must be produced by a special agency capable of spreading, and of entering and operating upon the system from without. As no agent of this kind can act where it is not, it has locality, and surrounds and pervades the bodies of those affected by it.

If scientific observation has not yet been able to demonstrate the material of the cholera cause, it has shown with a degree of certainty that many suspected conditions cannot be that cause.

Though the disease had its origin in a hot and moist climate, and is most likely to spread in one of that character, no particular condition as to temperature or humidity can be considered as the essential cause, as it has prevailed in every climate, and at all seasons—in every state of the atmosphere as to dryness or humidity, density or rarity. Neither does it depend upon any appreciable electrical state, as it has been found by experiment that the most opposite electrical conditions exist where the disease prevails. Though certain relations seem to exist between this cause and paludal malaria or marsh miasmata, yet the cause of cholera cannot be common malaria, as it has often prevailed where intermittents were never known, and has avoided, in its progress, many districts where these fevers most prevailed. Though the presence or absence of ozone may modify the action of the cholera cause, conditions as to ozone cannot be that cause itself, as cholera has prevailed both when there was an abundance and a deficiency of that material in the air.

Not only is there uncertainty as to what the material is, but there is much obscurity as to many of the conditions and the mode of its production, of its multiplication and diffusion. However produced or propagated, it is certainly progressive. It comes to a locality, it acts, it goes away or becomes inert. As the idea cannot be entertained that it was so abundant in its original source as to spread unincreased over so large a part of the world as it repeatedly has done, it must be reinforced as it progresses by additions to its quantity.

It can hardly be supposed to be the result of chemical actions, as we know of nothing analogous in inorganic matter; yet we are not authorized to positively deny that chemical changes may occur in some unknown ingredient in the atmosphere, induced on some principle of *catalysis*, producing a material capable of thus operating upon the system. The analogies, and certainly the general enlightened professional sentiment of the present day point to living germs, and suggest *parasitic organisms* as the *materies morbi* of cholera. The germinal theory of specific diseases has already been spoken of, and need not further be discussed. If accepted, the law of propagation will account for the increase of the poison, and the diffusion may be by increase, by winds, or by intercommunication. There seems to me little doubt that the atmosphere is the chief medium of diffusion, and that this poison may multiply and pass by spontaneous extension for considerable distances through the air; but particles of the germinal matter may be carried by ships, by caravans, or by persons from one point to another; and when thus brought into a locality containing the necessary ingredients and favorable conditions for its multiplication, the poison may be abundantly reproduced.

It is thought by many that the poison of cholera is contained largely in the discharges from the intestines, and that finding access to water it is spread and communicated by this element. That it is capable of spreading, and being communicated in this manner, is indicated by various facts; but that this is the exclusive or the chief means of its spread and communication the whole facts by no means show.

A statement of the facts attending the appearance of cholera in Chicago, in May, 1852, according with so many other facts in other localities and at other times, will illustrate the view of its spread which is intended to be expressed. Previous to the appearance of the disease in that city it had commenced its ravages along the Mississippi river, had passed up the Illinois river and appeared in the town of La Salle, some fifty miles from Chicago. A canal connects La Salle with Chicago, and boats were frequently passing from one place to the other. A boat from La Salle, but without any cholera patients on board at any time, was placed in dry dock in Chicago for repairs. Several workmen were engaged upon it, and the first case of cholera which appeared in Chicago was in one of these workmen, who took the disease in a few days after commencing his work on the boat, and soon died at his home in the south part of the city. The next case was some two days later, in a man who had had no communication with the other case, and who resided in a low and filthy situation near the centre of the city, a third or half a mile from the dry dock, and a much greater distance from the place where the first case had occurred. This last case was seen by me in the last stages of the disease, and was speedily fatal. Within the next three or four days cases had occurred at various points in almost every part of the city, without our being able to trace any communication directly with other cases, and some of the patients were women and children, who had not left their houses since the arrival of the boat from La Salle, which apparently brought the poison. From this time the disease prevailed more or less in every part of the city, but chiefly in the lowest situations, and in some dryer parts where water was used from wells, and was not, as in other situations, brought from Lake Michigan.

The conclusion that seems inevitable from this and many other similar instances is, that on this occasion, the cholera poison was brought in this canal-boat to Chicago, in the atmosphere, or attached to some of the freight. Finding there the conditions favorable for its multiplication, it was soon produced in sufficient quantity to pervade the whole city, producing its effects upon those most susceptible to its influence—at first upon a few, but soon, as it further multiplied, affecting large numbers, and continuing until the frosts of autumn and winter came, when it disappeared.

During the summer there was a large emigration to the Northwest from Sweden, Norway, and Germany, all coming to Chicago for distribution. Some of these emigrants came by railroad, and some by lake steamers. In July and August, when the disease in Chicago was at its height, a company of these emigrants, hurried on from the seaboard, with the accumulated filth of their long voyage within, upon, and around them, would frequently be attacked in a few hours in large numbers, sometimes upon the steamer, or the dock, or in the place of their first lodging in the city; and in these cases the disease ran a most rapid course.

This showed that the incubation period of the poison was short, and that the debilitated and filthy condition of such emigrants rendered them peculiarly liable to its speedy action.

The question of the contagiousness of cholera is one that has been much mooted, and, it must be confessed, sometimes without a clear appreciation of what constitutes a contagious disease. According to the definition already given, a contagious disease is one produced by a poison generated in the bodies of persons affected by the malady, and which is capable of transmission to others, producing the same specific affection. Unless the distinction is made between *infection* and *contagion*, vagueness and confusion will result. The term infection designates all morbid poisons which enter the body and infect it, while contagion is restricted to that class of poisons which is produced by the processes of the specific disease in the system, and is communicated to others, repeating the phenomena.

The facts in the history of cholera do not prove that this poison is exclusively produced in the bodies of the sick; but, on the contrary, in my judgment, they indicate that the poison is often, at least, produced independently of the bodies of those laboring under the disease, and that it is usually produced, multiplied, and diffused independently of those affected by it. The detailed reasons for this opinion the limits of this article will not allow to be stated. But that opinion, long since formed by reading the history of its progress and its incursions, and confirmed by a careful observation of its occurrence and spread in

Chicago and other places in the West, has not been seriously shaken by all the authoritative opinions and ingenious arguments which have since appeared. Of nothing have I been more clearly convinced from general observation, than that when cholera is prevailing in a locality, those who come in contact with cholera patients are not perceptibly more liable to the disease than those who, exposed to the same general conditions, avoid such contact. I by no means affirm that the poison is to no extent or in no degree produced in the sick, but it seems to me clearly that it is not wholly or chiefly so produced. I cannot doubt that it is multiplied, if not exclusively, yet very largely, outside of the bodies of cholera patients.

While, therefore, not denying its possible contagiousness, I do dissent from the opinion that, as in small-pox, the poison is produced and multiplied exclusively, or even chiefly, in the bodies of the sick, and that the disease is ordinarily produced by this poison being conveyed unchanged to others. The poison may have originated out of the body, and is certainly multiplied out of it.

This view, so strongly impressed upon my own mind by the facts observed, is held by nearly all observers in India, who have drawn their conclusions from large experience and not from speculative theories. With the support of the large body of English physicians in the home of cholera, I am confirmed in the convictions which could hardly have been shaken by statements however authoritative.

Though so much doubt exists as to the essential nature of the cholera cause and the particular method by which it produces its effects, yet the circumstances and conditions, as regards localities and persons, which favor the spread of the poison and render its action more effectual, are well established. Though in particular cases general rules are set at defiance, yet the facts respecting co-operating causes are sufficiently uniform to establish the general rules.

Briefly and generally stated, the *localities* most liable to the spread of cholera, other things being equal, are those which are low, moist, and, particularly, *filthy*. Warm climates and seasons are more favorable than cold, and a densely populated region than one sparsely settled. It is more liable to follow water-courses and thoroughfares, partly because these are usually more low, filthy, and densely populated ; and partly, no doubt, because the poison is conveyed by intercommunication. Still, in its progress it takes general, and sometimes particular courses, in obedience to laws we do not understand. All experience has shown that the existence of decomposing organic material in the soil and the air favors the spread of the disease, probably by furnishing a pabulum for the development of the poison, and a nidus for its existence and action in the bodies of those inhaling the foul air or imbibing foul ingesta.

With regard to the classes of persons most liable in the same localities to be attacked and become its victims, the intemperate, the destitute, the filthy, the vicious, the enfeebled, the terrified, and the degraded, are immeasurably more subject to its ravages than those in opposite conditions. Yet, when the poison is abundant and possesses great activity, no class or condition can claim an exemption ; but the cases are so rare in which the poison is sufficiently intense to affect perfectly healthy persons, who place themselves under the most favorable circumstances, and avoid all predisposing or accessory causes—in short, obey all the hygienic laws—that the violations of these laws become the conditions of attacks—in other words, the *predisposing or accessory causes*, in a vast majority of cases at least, become necessary antecedents to the production of the disease. So much have the habits and state of individuals to do with the prevalence or suppression of this scourge, that, as a general proposition, it may be stated that the "cholera poison owes its potentiality to the conditions in which it finds the subjects of its invasion." In this view of the subject, a knowledge and the avoidance of these particular predisposing causes become matters of the most vital importance.

The existence of decomposing matter in the system has already been referred to as a condition favoring the operation of the cholera poison. This is a view now very generally entertained, not only in relation to cholera, but to other zymotic diseases as well. Dr. Wm. B. Carpenter, of London, arranges the generally recognized predisposing causes of these diseases under three heads, viz.: 1. Those which tend to introduce into the system decomposing matter that has been generated in some external source. 2. Those which occasion an increased production of decomposing matter in the system itself ; and, 3. Those which obstruct the elimination of the decomposing matter naturally or excessively generated within the system, or abnormally introduced into it from without.

Under the *first* head is ranked the ingestion of putrescent food, of water contaminated by sewage or other decomposing matter ; and the inspiration of air charged with putrescent or miasmatic emanations.

Under the *second*, any unusual source of degeneration of tissues within the body, such as excessive muscular exercise, injuries, etc., and here may be added, fear, despondency, and other depressing passions ; and the derangement of the secretions.

Under the *third*, an insufficient supply of air, a high external temperature (which slackens the respiratory process), and the ingestion of alcohol ; to which should be added, the sudden occurrence of a cooler and moister atmosphere, as a rain-storm after unusual heat, checking secretion from the skin. If there be added to this category of causes insufficient food, and any influence not enumerated which may depress the vital energies—and particularly if there be added also those substances, whether in the shape of indigestible food, of medicines or of luxuries, which will irritate the mucous membrane of the stomach and bowels—we have the conditions predisposing to cholera.

The history of cholera which occurred under my own observation in Chicago, during the seasons already referred to, corroborates, indeed is the chief foundation of the views which have been taken of the etiology of the disease. The minutely recorded details might be of interest, but they are necessarily excluded by the limits I have assigned myself on this subject.

With a reference to the following historical incident, I shall close the subject of the *cause* of cholera, and proceed to the other divisions of the general subject already indicated.

Dr. Verrollot, Physician to the French Embassy near the Sublime Porte, has written a minute history of the spread of the epidemic in 1847 through Asia and a part of Europe. In describing its general spread and terrible ravages, from the shores of the Caspian Sea up the river Volga, among the semi-civilized Mussulmans, and still more filthy and degraded Russians, he mentions with great but reasonable enthusiasm one place as a remarkable exception.

"There is a small Moravian colony called Sarepta, situated in a bend of the river, in the midst of the Kalmuck hordes, eulogized by all travelers for its remarkable industry and minute cleanliness, and for all other laudable and fortunate features of character. The cholera seemed to respect this sacred spot, passing by in 1830 and in 1848, without inflicting on it the least evil." This fact, corroborated as it is by multitudes of others of like character, speaks volumes on the subject of prevention ; and the success which has attended the various sanitary measures in Europe, and, so far, in this country, during the recent visitations of the disease, confirms these general etiological views. If the inhabited globe were a Sarepta, this terrible scourge would disappear from it forever. The conditions for the origination, the multiplication, and extension of the poison would cease to exist, and there would be no subjects favorable to its attacks.

Symptomatology.—The phenomena—the symptomatology and pathology of cholera—I propose to present but briefly.

The external features or symptoms of the disease are of a striking character and are readily recognized.

The disease is usually divided into *four* stages. These stages, as is the case with the more or less arbitrary divisions into stages of most other diseases, run into each other, and are not always well defined; neither do they all exist in every instance, but in their general outline may commonly be observed.

The *first* is the *Premonitory Stage,* marked by general lassitude, dull pain above the eyes, sometimes constrictions in the calves of the legs, disturbed digestion, abdominal uneasiness, slightly coated tongue, and *diarrhœa.* This stage is not always observed, and when it is, is liable to vary much in the number, severity, and duration of the symptoms; but it usually may be traced, the premonitory diarrhœa, usually painless and watery, occurring in a very large proportion of the ordinary cases, and continuing from several hours to some days before the full development of the disease, or the arrival of the

Second Stage, which is marked by active vomiting and purging of a fluid which soon becomes of a rice-water appearance; by great thirst, coldness of the surface, severe spasmodic pain or cramps, particularly in the abdomen and extremities. In the commencement of this stage the pulse is sometimes a little excited, and not unfrequently quite firm; but it soon becomes more and more feeble as the impression of the poison is more profound, and as the exhausting discharges continue. Toward the latter part of this stage, the surface becomes much shrunken and more or less blue, and may be comparatively dry, or covered with perspiration. When the disease is severe, this stage only lasts a few hours—in less violent cases it may last a day or more—when, if reaction and improvement do not occur, it passes into the

Third, or Stage of Collapse, marked by loss of circulation, labored respiration; the skin being shriveled, livid, and usually bathed with cold perspiration. The discharges sometimes continue in this stage, though less profusely; at other times they are suspended, even that from the skin, either from exhaustion of the fluids of the system, or from a suspension of nearly all vital action. The pain and cramps sometimes continue in this stage, while in other cases they cease, the patient becoming more quiet and comatose. During some parts of the second stage a ringing in the ears usually occurs, and the voice becomes husky and peculiar. These symptoms usually continue throughout the remainder of the disease, the huskiness of the voice increasing in the third stage, until the patient is able often only to articulate in a whisper. Those who survive the active onset of a severe attack, especially if the disease pass into the third stage, are liable to the

Fourth Stage, presenting the characters of a low irritative fever, generally accompanied by protracted local congestions, or a low form of inflammation of the mucous membrane of the intestines, particularly of the follicles of the mesenteric glands, and other abdominal viscera, and of the brain and spinal marrow. Occasionally cases of cholera morbus, or what has been called English cholera, occur, and also serous vomiting and purging during the progress of malarial fevers, which, in their external symptoms, resemble very nearly genuine epidemic or Asiatic cholera; yet they differ, as I apprehend, in the essential cause, and certainly as regards fatality—the former class of cases being almost always amenable to proper treatment, even if the treatment be not commenced until an advanced stage; while the mortality of the latter, when the same apparently advanced condition is permitted to occur, is too well known. Dissimilar causes not unfrequently produce similar, though perhaps not in every respect identical effects, and these cases of sporadic and accidental cholera are not produced by the specific poison which gives the epidemic variety its virulence.

The particular manner in which the cholera poison, when introduced into the system, produces its effects, is still a matter of conjecture. Whether by changing the chemico-vital relations of the blood, or by primarily attaching itself to the nervous or other tissues and changing their actions, we may not say; but soon, and earliest, its effects are manifested upon the *ganglionic nervous system*. Though these nerves of organic life are not always found perceptibly changed in structure after death, they are sometimes softened and enlarged, and their functions in the progress of the disease are modified, diminished, and in severe cases rapidly overpowered. That portion of the brain and nervous system which is engaged in thought and mental sensibility is left comparatively undisturbed; while all the functions depending upon the organic nerves, such as nutrition, secretion, exudation, circulation, and respiration, and their consequences, as animal heat, and the general movements of the system, are either enfeebled, suspended, or greatly modified. Digestion seems entirely suspended—glandular secretions, particularly of the liver and kidneys, are either suspended or greatly diminished. The circulation of the blood, so directly under the control of the organic nerves, is much retarded, apparently to a great extent, at least, by spasm of the smaller vessels of the surface; the vital fluid retiring to and congesting the internal organs. Respiration is diminished and labored; the blood, consequently, is not well oxygenated, and animal heat is reduced.

While these general morbid phenomena are occurring, and frequently as the first in the train of apparent symptoms, the circulation and secretion of the mucous membrane of the alimentary canal become specially deranged. The ganglionic system everywhere, but more particularly in the stomach and intestines, governs the capillary circulation. The paralyzing, deranging influence of the cholera poison upon the organic nerves produces the derangement of action which causes the diarrhœa, and it increases in its effect during the more active stage of the disease. The blood flows into these vessels in unusual quantities, producing hyperæmia, irritation, and copious discharges, consisting of the thinner parts of the blood, which contain a large portion of its salts. The blood is thus deprived of its more fluid portions, of its salts, and, by diminished respiration, of its oxygen; and being, moreover, loaded with urea and the elements of bile, from the suppression of the secretions of the kidneys and liver, is unfit for the uses of the system. The spinal nerves then become deranged in their functions, and the most painful spasms occur. When the disease in a grave form arrives at this stage, and is uninfluenced by treatment, collapse and death are the usual results.

When, from the somewhat less severe form of the disease, or greater powers of endurance, a patient survives these conditions, the increased quantity of blood in the mucous membrane of the alimentary canal produces an inflammatory hyperæmia, and in many cases a decided degree of inflammation. There is usually, however, no organizable plastic matter poured out, but a material something like the exudation of diphtheria; and perhaps the most characteristic product of the disease is an infiltration of a peculiar granular matter into the mucous membrane, and particularly into the glands of the intestines. The investigations of Harner, of Pirogoff, and others, and the delineations of Lebert, go to show the inflammatory character in many cases of the hyperæmia and exudation, when death does not occur too soon to allow of its development. Not only the alimentary canal, but the membranes of the brain and spinal marrow sometimes, and more rarely the lungs, are involved in inflammation.

The only marked appearance approaching to uniformity, in the bodies of those dying in the collapsed or asphyxiated state of cholera, is that of congestion or hyperæmia, with the peculiar infiltrations into the glands of the intestines already referred to, the latter especially occurring oftener in the more protracted cases.

Dr. George Johnson, of London, has attempted to show that the loss of the fluids of the blood is not the chief cause of the severe and fatal symptoms in cholera, but that they are due to the impeded passage of the blood through the lungs from the right to the left side of the heart; and that this obstruction is produced by a morbid contraction of the muscular coats of the pulmonary arteries, and that this contraction is in turn caused by a specific morbid poison in the blood. It cannot be doubted that impeded circulation of the blood through the lungs, and imperfect oxygenation of that fluid contribute largely to the fatal results; but yet it is true that such obstruction of circulation and deficient oxygenation *very seldom* occur until the blood is rendered thick and incapable of circulation by loss of its fluids and salts, and by the retention within it of urea and the elements of bile—though probably the blood is rendered still more injurious by the presence, in addition, of a specific morbid poison. The loss of the fluids is by no means the sole cause of the fatal symptoms, as patients occasionally die without such loss; but such cases are the very rare exceptions, and in ninety-nine out of every hundred deaths from cholera, the loss of the fluids is a chief, and even essential element, in the complex condition producing the results. The practical importance of these pathological views will be more fully appreciated when the subject of treatment is considered.

In reviewing the ground already passed over, it may be stated that cholera is essentially produced by a peculiar poison, the exact nature of which is not fully understood; that this poison is aided in its production and diffusion by certain local conditions, the chief of which is filth; that the action of this poison in the system is promoted by the presence in the blood of decomposing organic materials; that the effects of the poison are first manifested upon the ganglionic or organic system of nerves; that very generally, among the earliest and most important morbid effects which the paralyzed and deranged condition of the nervous force produces, are congestion and irritation of the mucous membrane of the alimentary canal, and profuse exhalations from its surface, leading to a watery diarrhœa, and at length to violent vomiting and purging of a nearly transparent fluid; that losses of the fluid portions of the blood, together with the retention of certain excrementitious matters, aided probably by the peculiar cholera poison, so change the physical, chemical, and vital conditions of that fluid as to produce spasms of vessels, and cramps of various muscles; to produce obstructed circulation and respiration, and finally collapse and death. That occasionally, though very rarely, the cholera poison effects such changes in the blood, and in the actions of the nervous system, as to suspend the necessary life functions and cause speedy death without the loss of fluids; but that such cases are so few and exceptional as to afford no basis for a rule of practice in the ordinary forms of the disease.

We are thus brought to the last and most important division of the subject:

The Treatment of Cholera, Prophylactic and Curative. —The prophylactic management of this disease, so apt to be fatal when it has made an attack, and usually so easily prevented, is of the first importance, and of course consists in the avoidance of its causes. These causes having already been referred to, need not be repeated in detail, though a few particulars require a more special notice.

The views entertained of the mode of propagation of the cholera poison, and the local character of many of the predisposing causes which give that poison its potency, and particularly my own observation while acting as the Medical Adviser of the Board of Health of Chicago, have impressed me with the great importance of giving special attention to the particular localities especially affected in a city or town, and to the groups of persons among whom the disease may appear.

In such particular localities where the disease is raging, it will usually be found that many are crowded together under unfavorable hygienic conditions; and when this is the case, no pains or expense should be spared to remove instantly every such condition, and to effect a dispersion of the persons thus grouped, due regard being had to the safety of others where these persons may be sent. If those who have been thus exposed to even a concentration of the poison are well washed in person and changed in apparel, and are, in their new situation, placed in clean and well-ventilated apartments, the danger to others among whom they may be placed will be extremely slight, even should the persons brought among them experience attacks.

As there will usually be difficulty in finding places among others for persons fleeing from a locality specially infected, it would be a most wise and humane provision to have temporary buildings or tents erected in the most favorable positions in the neighborhood of an infected city, where such persons may be taken and provided for under the most rigid sanitary regulations. The propriety of such procedures, and their immense influence in arresting the progress of the disease and saving life, cannot be questioned, nor can they be too strongly insisted upon by those who act as guardians of the public health.

In a preceding passage the use of alcoholic drinks was simply mentioned, on the authority of Dr. Carpenter, as a predisposing cause of cholera; but as there is at least a remnant of a popular opinion lingering among some that these drinks act as preventives to the disease, the subject may be referred to in this connection. The results of all modern research, and of the profoundest professional reasoning respecting the physiological action of alcohol, as well as all observation everywhere of its influence upon cholera, concur in the conclusion that so far from being a preventive to the disease, however used, it especially predisposes to attacks, and renders the cases, when occurring, more severe. It interferes with the process of respiration, favors the accumulation of effete and decomposing materials within the body, and tends to irritate the mucous membrane of the stomach and bowels. When taken in any considerable quantity, it cannot fail to irritate the nervous centres and derange the functions of organic as well as of animal life, and it has not the slightest claim to be regarded as an antidote to the cholera poison. There are, indeed, no known specifics for destroying the cholera poison or of preventing, directly, its effects; and all medication should be avoided unless symptoms occur. The system should be kept in as natural, as uniform, and as healthy a condition as possible, with the mind calm and confiding, yet active and cheerful.

The therapeutics of the disease—the principles and details of its palliative and curative treatment—will be the next subject in order.

Although cholera is a disease so uniform in its essential cause, and so identical in its nature, yet should an attempt be made to follow "authorities" in a description of its curative treatment, so many diverse and conflicting statements would be met with requiring record, that the writer, the reader, and the inexperienced practitioner in the disease, inclined to be led by such a guide, would be alike confounded. Nothing, in fact, as to treatment in this disease, seems quite settled in the general mind of the profession; and this, taken in connection with the further fact that statistics upon a large scale, from the earliest period of its authentic history to the present time, have shown that from forty-five to fifty-five per cent. of the genuine cholera attacks have proved fatal, would seem to indicate that there is little power, or at least choice, in remedies. Still there is both power and choice of remedies in the disease, and I cannot restrain an expression of the conviction that there are few diseases more susceptible of being influenced in their results by treatment than this; very few where the services of a prompt and skillful physician can be made more valuable. Most other acute diseases with which we meet will terminate favorably if left to themselves, while a large proportion of these will not; and when, in genuine cases, there is a large proportion of recoveries, as may be the case, the result is without doubt due to treatment, and demonstrates its great value.

It would seem strange that a disease so uniform in its causes and course, and withal so capable of being influenced by remedies, should have remained so long a time under investigation, without a course of treatment being found, upon the adoption of which the profession generally would agree. But though the disease is thus essentially uniform and identical, there are numerous varieties as to several particulars; and more than this, there are contradictory elements and conflicting indications in each case; and it is to be regretted that writers generally have not analyzed these elements as closely, and pointed out the conflicting indications as discriminatively as is desirable. The arrival at fixed and generally accepted truths, when the problems are complicated, and dependent for their solution upon numerous observations made by many persons, and upon the deductions of various minds of different constitutions, is necessarily a slow process. Unfortunately, also, for the arrival at truth, many who have speculated most upon cholera, and have furnished the profession with the largest portion of its literature on the subject, have seen very little or nothing of the disease. When all these circumstances are considered, we need not be so much surprised at the present state of the therapeutics of the affection.

Though what is to follow may or may not add to the variety of opinions already recorded, it will not be confused and obscured by the statement and examination of many contradictory methods of treatment; but there will be an attempt to give a description of the treatment only which my own experience, study, and reflections, have led me to regard as the best of which I have any knowledge. There is, however, no little difficulty in giving a clear, discriminative, and intelligible description of the treatment which should be pursued as adapted to the different cases met with, and their various stages, in actual practice. Indeed, in the details of proper management, so much depends upon the peculiarities any particular case may present, the different degrees of rapidity with which it may pass through its different stages, the constitutional and other special conditions of the patient in various respects, the different manner in which remedies may be borne, the special impression upon various organs and functions which may be produced by them, etc.—so much of the appearances of the patient, from which we form conclusions, can be learned only by experience—and in the doses and timing of medicines so much must be left to the judgment, that a full and correct representation of the best treatment, with all its adaptations, cannot without illustrations be made.

As the best means, however, of approximating to such a representation, I shall first express some general views of indications and the means of fulfilling them, based upon pathological and therapeutical principles, and afterward attempt a more minute and specific account of the manner in which I would apply these principles—of the special mode of procedure in the treatment of cases.

In the absence of such a positive pathology as reveals clearly the nature and succession of the essential morbid actions, and points unerringly to all the proper remedies—in the absence also of ascertained specifics, the attention of the physician should rest upon such morbid conditions as he believes to be present, and his efforts should be directed to the correction or removal of such conditions; and if the primary or essential diseased condition, and the means for directly removing it evade his knowledge or power, he must direct his efforts to the correction or removal of the obvious disturbances of the functions; and thus, by putting the system as nearly as possible in its normal condition, prepare it to endure the shock of the morbid cause, and assist it by every possible means, as a sailor would a dismantled ship, to weather the storm.

It has already been stated that the cause of cholera makes an early and decided impression upon the ganglionic system of nerves—those nerves presiding over the respiratory, circulatory, secretory, and assimilative functions; and that as a consequence these functions are, each in its peculiar mode, and all more or less seriously, disturbed. The stomach and bowels are generally the seat of such decided irritation, and the source of such peculiar and profuse discharges, that they are regarded by many who have written upon the subject as points of a primary and principal morbid impression. But whether the impression upon the mucous membrane is primary, or whether, as I believe, these morbid phenomena are the results of the impressions upon the nerves of organic life, the symptoms themselves are of the greatest importance; and in a large majority of instances require first, and most imperatively, the attention of the physician; for, whatever may be said by those who have studied this subject in the closet rather than at the bedside, if this irritation be not allayed, and these discharges be not controlled, neither nourishments nor medicines are retained in the system, the patient is soon deprived of a large part of the fluid portions of his blood, the remainder becoming unfit for its uses, and he is soon exhausted, and often speedily carried beyond the reach even of hope.

It must, however, be borne in mind that this irritation and these discharges are not the sole causes of the depression and collapse—in fact, that in some of the most rapidly fatal cases no evacuations occur—and that diminished circulation, diminished respiration, diminished animal heat, and diminished glandular secretions (of the liver and kidneys) are more constant symptoms than profuse evacuations, and therefore, in the treatment, other conditions than the vomiting and purging are entitled to constant attention. In this view of the subject, the following leading indications are presented:

1st. To arouse and maintain the sensibility and proper action of the organic nervous system; and

2d. To excite and correct the action of those organs whose natural functions have been suspended or perverted, whether from direct impressions upon them, or by a failure of that nervous influence upon which their integrity depends; and in a more particular manner, often first in time as well as in importance, when the gastro-intestinal irritation and exhausting discharges are present, the indications are to allay that irritation and arrest the discharges.

Now by what means shall these indications be fulfilled? Unfortunately we are yet but little acquainted with any direct beneficial influence of remedies over the organic nervous system. When this system is debilitated or deranged in chronic diseases, hygienic regulations are more efficient than any known specific medicines. But here the most prompt action is required. There is, in cholera, so much prostration, such an appearance and real danger of rapid sinking and fatal exhaustion, so much spasm and pain, and such profuse discharges, that stimulants and anodynes are resorted to almost instinctively, and alcohol is often given; and opium, though so useful when properly managed, may be administered with too much freedom, and is frequently used with far too little discrimination.

There can be little doubt that opium, alcoholic mixtures, chloroform, etc., particularly when given in free doses, tend to depress rather than exalt the energy of the nervous system of organic life. Though this may not be the effect of these articles uniformly and in all doses, it certainly is often, and generally so, even in their primary actions, when administered in large quantities. If alcohol, in certain quantities and under certain circumstances, does temporarily excite the nerves, still by depriving the blood of its oxygen, diminishing the natural effects of respiration, and retarding other vital changes, its secondary effects become often powerfully depressing. The same is true of opium and other narcotics, in a greater or less degree. These facts should not be lost sight of; and while these articles may be useful, and opium particularly, even in pretty free doses, quite essential for fulfilling the indications of allaying irritation, and arresting vomiting and purging, regard should always be paid to their depressing effects on the vital powers. No language can be too strong in condemning their use in large quantities, in the *advanced* stages of the disease. Both principles and experience go against the practice, and facts, under my own observation, have convinced me that many lives have been sacrificed by it. *Alcohol is very seldom useful in cholera under any circumstances.* It not only fails to meet the indication of sustaining the vital powers, but it also usually fails to exert a beneficial influence over the vomiting and purging; in fact, it increases the irritation of the mucous membrane, and disposes it, as well as the brain and other parts of the system, to inflammation and its consequences, in case the patient survives the earlier stages of the disease.

Opium, in proper doses and combinations, in the earlier stages of cholera, before the vital powers are much exhausted, and while irritation of the stomach and bowels is the most prominent symptom, is *the great remedy* in the disease, or, at least, one of the prominent and essential items of a correct treatment. It is by far the most potent remedy we possess for allaying that irritation, arresting the flow of fluids to the mucous surface, and controlling the debilitating discharges; and when these effects are produced by its use, the system, by other proper aids, is generally enabled to rally and struggle successfully against the morbid influences. But when the powers of life are low, when the blood is deficient in oxygen, loaded and black with carbon, the free administration of an article which in full doses produces even in healthy persons similar effects, can but be productive of severe and fatal results. I dwell upon this point because of its exceeding importance, and will recur to it again when describing the particular mode of managing cases.

In selecting stimulants, then, to arouse the nervous energy, we should prefer those which will not diminish the oxygen of the blood, as some of the most constant and dangerous symptoms are produced by such diminution. Opium, alcohol, chloroform, and ether, as already stated, have to a greater or less extent that effect.

With reference to this indication, we shall experience better results from such articles as quinine, coffee, mustard, ammonia, capsicum, camphor, cassia, valerian, and oil of turpentine. The bromide of ammonium has been suggested on theoretical grounds, as fulfilling the indication of regulating organic nervous action, but I am not able to say that the theory has been verified by actual experience in this disease.

An emetic dose of salt and mustard is strongly recommended by some, and may have a good effect in arousing the organic nerves and changing the train of morbid actions. But if this is resorted to at all, it should only be considered as preliminary to other treatment, and during the period of quiet succeeding its immediate operation the introduction of other remedies must not be neglected.

But there is another system of means for answering this indication of arousing the nervous energy, which is worthy of attention. We know that when the functions of the organic nerves are overcome and suspended by a poisonous dose of prussic acid, opium, alcohol, or chloroform, the most effectual means of arousing them to action are sudden dashings of cold water upon the surface, cold affusions continued for a short time and repeated, and the abundant inhalation of fresh air, improved by the addition of the vapor of ammonia or oxygen gas.

We might infer that this same system of means would be useful in cholera, and in many cases it has been so found. When these cold applications are used, during their intermissions, reaction should be encouraged by frictions, warm flannels, and sinapisms.

I have used these cold affusions only in a few cases, and most of those were in a condition not favorable for the success of any treatment; but I have generally been able to procure a degree of reaction, and the results of the experiments made impressed me favorably with the remedy. I consider it worthy of further trial.

To fulfill the second general indication, viz.: that of exciting the dormant, and correcting the morbid action of the different distinct organs, such as the liver, stomach, kidneys, etc., thus endeavoring to restore, as far as possible, their different functions to their normal conditions, a variety of means must be used.

To correct the exhalant and other functions of the stomach and bowels, to allay the irritation and arrest the profuse discharges, opium, in my opinion, as anticipated by preceding remarks, is the chief remedy. In order that it be retained and have a speedy effect, abstinence from drinks in considerable quantities must be enjoined, and the medicine given in minute division, triturated with some other substance; and its effects may be aided by counter-irritation over the epigastrium, and indeed over the whole abdomen, and sometimes by various astringents. The acetate of lead is regarded by many as the most useful of the astringents; but it affects the purging more than the vomiting, and controls this purging much more manifestly when given by enema, after an impression has been made upon the stomach with opium. When thus used in a moderate quantity of fluid, and combined with a quantity of laudanum varying with the condition of the patient, and the amount of opium previously taken, the effect is often most happy.

To excite the liver to its natural secretion, and modify other secretions, thereby relieving the blood of much of its effete matter, calomel should be given in repeated doses. When thus operating it usually changes the whole character of the disease. The use of this article I consider of exceeding importance. My observations upon it have been careful and abundant, and I think I cannot be mistaken. The discharges may often be checked without its use, and temporary improvement produced; but unless the secretion of the liver be excited (and calomel, when properly given and retained, tends powerfully, and far more than any other article, to excite that secretion), the cholera discharges will again return, and severe consequences are likely to follow.

The indication for calomel exists in the early stages of the disease, and continues present until the symptoms are controlled, the action of the liver restored, or until a sufficient quantity is given to produce all the beneficial effects of which the medicine is capable.

I am by no means insensible to the injurious effects, both proximate and remote, which the free, or even moderate use of mercury, under many circumstances, produces. I have no sympathy with that class of practitioners forever seeing some "liver complaint," or "bilious obstructions," and hurling heroic doses of calomel, or everlasting "blue pills," at these so often imaginary difficulties. But mercury is a medicine of power, and has its uses; and cholera is one of the diseases where its remedial virtues are greatest. In this disease it seldom produces salivation or other remote injurious consequences, and even if it did much more frequently, considering the extreme danger of the patient and the good effect it produces, we should be justified in its use.

To excite the action of the kidneys, diuretics may be given whenever the stomach will retain them, and when they will not interfere with other more necessary remedies, or produce any other unpleasant effects. Oil of turpentine and spts. nit. dulc., infusions of broom or juniper are among the best articles of this class. They are, however, so uncertain in their operations, that they should not be given at the risk of disturbing the stomach or bowels.

To counteract the deranged state of the sanguineous circulation, which is always great in the full-formed stage, amounting to a considerable degree of obstruction in the capillaries, and to a decided obstruction of the circulation from the right to the left side of the heart through the lungs, with a general congestion of internal organs, various means have been suggested and practiced. Any course which will contribute to the first indication—that of arousing the nervous organic energy—will do much to accomplish this; but there are other means which act more directly in effecting this object, among which is blood-letting.

This may seem a desperate remedy, and certainly should be used with the greatest discrimination and caution. There is, however, much testimony in its favor entitled to the highest respect, and my own experience enables me to express the opinion with confidence, that there is a class of cases occurring in the robust and vigorous, marked by a degree of hardness of pulse, by a violence of pain and cramp, without very free discharges, where, at the proper time—the early stage of congestion—duly aided by other means, and these perhaps stimulants, it will operate most beneficially. McIntosh has long since shown, and his observations have been abundantly confirmed, that bleeding, in the congestive or cold stage of intermitting fever, affords the greatest temporary relief, and would be generally indicated in the cold stage of the ague, were it not for the more remote consequences, the continued debility and impoverishment of the blood which would follow.

I have resorted to bleeding in cholera only in a small proportion of cases, as the large majority of those I have treated in the disease have been foreign emigrants, debilitated from recent sea voyages, or others whose vital powers were low; but whenever I have practiced it under the circumstances described, I have been pleased with the result. The cramps, pains, blueness, and oppression of breathing have been relieved, and all the symptoms have taken a milder form.

Another means for the relief of this congestion in cholera, less hazardous in its effects, is the use of dry cupping. The cups should be applied along the spine and over the abdomen. A large cup or common tumbler suddenly applied over the stomach will often produce a marked effect in allaying the nausea and vomiting, and enabling the stomach to retain medicines until they can make an impression.

Nearly akin to this and to blood-letting, combining in some degree the advantages of both, and avoiding some of the disadvantages of the latter, is the ligation of the extremities, near the trunk, thereby detaining for a time a portion of the blood in the vessels of the limbs, and when the necessity for its detention has passed by, allowing it to return into the general circulation. Whether the blood may not be deteriorated by this detention, so as to be in danger of unpleasant effects, has often suggested itself to me; but I have not been able to discover evidence that this is the case, and if it be not, this plan must possess some advantage over blood-letting. I have practiced it frequently, and with satisfactory results. Besides the general effects, it often relieves in a marked degree the cramps in the limbs thus treated. Sinapisms, frictions, external warmth, and other modes of cutaneous irritation, directly conduce to the relief of congestion, and sometimes act beneficially in arousing nervous energy.

Quinine has already been referred to as being useful in fulfilling the indication of arousing and sustaining the nervous energy; and by this mode of its operation, or in a more direct manner, its action tends decidedly to remove internal congestions—to equalize and free, as it were, the restrained and obstructed circulation. It thus becomes a means, and a most powerful one, of answering the indication of regulating the deranged circulation, upon which so many serious consequences depend. Though I have no knowledge of its having been used hypodermically in cholera, I should have no hesitancy in injecting a solution of it into the areolar tissues, where the indication for its use was present, and the stomach was not able to retain and absorb it. It might thus be given in the stage of the most active vomiting and purging, and probably would act as beneficially in this as in other stages of the disease. That it has an immediate effect in relieving the symptoms of congestion in malarious fevers, and that too perhaps independently of its antiperiodic influence, is quite certain; and the analogy between the congestive state of a malarious fever and the algid condition of cholera is quite apparent. At all events, whatever the mode of its action—whether by sustaining the nervous energies, or by some other means more directly relieving the system of capillary, pulmonal, or general visceral obstruction and congestion, or by some peculiar antidotal influence neutralizing the effects of the cholera poison, as this article seems to neutralize the poison of periodic fevers—it has a decided beneficial effect in the disease, and after the stomach is quieted by opium, and very probably before, if used hypodermically, the chances of recovery are decidedly enhanced by the administration, in divided doses, of from a scruple or half a drachm to a drachm of quinine. Where much opium has been given, it enables the system to bear that article better, preventing to a considerable extent its depressing effects.

As cholera prevailed in Chicago, particularly in 1854, its cause was mingled with the malarious poison, and as is the case with various other diseases in the West and South, the cholera was modified by malaria, and, in most of the cases, assumed more or less of a periodical type. A patient seized with a malarious chill, when the cholera poison was present and acting upon the system, would have that chill merged into the phenomena of cholera.

Profuse vomitings and purgings of a serous fluid, accompanied with cramps and other phenomena strikingly resembling genuine cholera, not unfrequently occur in malarious fevers when no epidemic cholera influence is present; and when such cholera influence prevails, the occurrence of the phenomena of fever will very often *precipitate a cholera attack*, and though the symptoms for the time being are controlled, they will recur with increased violence with the reappearance of another paroxysm of the fever—the weaker affection becoming merged in the stronger. In all such cases, *a full antiperiodic quantity of quinine is an absolute necessity*, and here certainly from half a drachm to a drachm, in divided doses, must be promptly introduced into the system, the whole being given some time before the period for the recurring paroxysm, which must be presumed to take place in twenty-four hours. The type may be tertian; but as this cannot be known beforehand, and the return of another paroxysm would be likely to be fatal, action must be taken as though it were quotidian. *A recurrence must be prevented.*

The importance of quinine in such cases is measured by the difference between success and failure—between the life and death of the patient. There is here the imperative indication of interrupting the malarious paroxysm, which the quinine will do, while at the same time it fulfills the other indications before referred to.

If these views are correct, and of their correctness I have the most abundant reasons to be assured, no language can be too strong in urging them upon the attention of the profession. The malarial influence is by no means confined to the West and the South. In various localities in the Middle, and even Eastern States, Intermittent and Remittent fevers, more or less perfectly marked, have a considerable prevalence, and the malarious poison, in sufficient quantity to modify other diseases, is still more widely diffused. Quinine is exceedingly important in the treatment of cholera everywhere, but is *peculiarly* and *inexpressibly* so in all those cases mingled with, and influenced by, the malarious poison.

To correct that condition of the blood which arises from deficient respiration, and from a loss of its watery and albuminous portions and its salts in the discharges, free, full inspirations of the freshest air must be encouraged, and a solution of common salt and bicarbonate of soda may be given, when the stomach will, without inconvenience, retain it; and chicken broth or beef-tea, well salted, must not be omitted. The chlorate of potash is another article which, on chemical principles, and from its analogous effects in other diseases, would be suggested; but I have no experience with this salt in cholera, and can therefore only suggest its use.

Saline solutions have not only been given by the mouth, to correct these conditions of the blood, but they have likewise been injected into the veins; and in this, the object aimed at is commendable; but the operation of injecting the veins is a delicate and dangerous one, even under the most favorable circumstances of superior apparatus and skillful hands, and cannot be adopted with benefit in general practice. Its effects have been only temporary.

We have now passed over the leading indications in the treatment of cholera, and have referred in somewhat general terms to the principal means by which those indications are to be fulfilled, and it now remains to attempt a more particular account of the details of procedure—of the particular stages and conditions indicating particular remedies and combinations, and the dose and the timing of each article or compound applicable to the various conditions which occur. In doing this, it will be necessary to refer again to the different remedial agents just considered, and something like repetition cannot be avoided; but it is better to repeat many things, rather than to fail in giving a distinct idea of the treatment to be pursued. It is not easy to combine in the same train of remarks the pathological and therapeutical principles involved, and the minute details of procedure.

In an active and severe case of cholera, the disease passes through so many stages in so short a time, and these stages are so variable in their duration, and each requires such modifications of treatment, that the patient, in order to be skillfully managed, must be visited very frequently; the amount of medicines taken and retained, and every symptom and condition must be particularly inquired into, and if the memory be at all treacherous, should be carefully noted down. The nurses must be faithful and sensible, and must have the most definite and explicit instructions in every particular. The physician must be cool and collected, and must have every faculty of his mind fully awake and concentrated upon the work. He who cannot come up to these requirements, who has not the health, or the vigor, or the courage—who has not indomitable perseverance and sleepless vigilance, and who, moreover, has not some definite ideas of the proper treatment, and some confidence in remedies, will consult his own peace of mind, and the interests of the community, by avoiding, as some do, the treatment of all cases of this disease.

When, during the prevalence of epidemic cholera, a patient is affected with the premonitory symptoms of the disease, and especially if diarrhœa be present, he should immediately be sent to bed in a comfortable and well-ventilated room, with warm covering, adapted, however, to the temperature. The state of the skin should be inquired into, and if not in perfect condition as regards cleanliness, a warm bath, or sponging with warm soap and water, or saleratus water, should be used. A powder, consisting of from one to three grains of *opium*, with the same amount of *camphor*, well triturated with sugar (or the equivalent of this powder in laudanum and spirits of camphor), should be immediately given, and if the discharges are inclined to be watery, colorless, and destitute of bile, from two to six grains of calomel, or its equivalent of blue pill, must be added. This dose must be repeated in from an hour and a half to three or four hours, if the discharges are not completely arrested, and the sensations of abdominal uneasiness removed. After from eight to fifteen grains of calomel are given, unless the symptoms assume considerable severity, this article may be omitted; but the opium and camphor must be continued until a decided narcotic influence is produced, or until all symptoms of the diarrhœa are removed. Should the diarrhœa not yield readily, acetate of lead or tannin should be added to the opium, in from two to four grain doses; or what is still more effectual, enemata of ten grains of the lead with a tea-spoonful of laudanum in three or four ounces of some simple fluid, plain water answering every purpose, at a temperature a little above that of the room, must be given and repeated once an hour, or oftener if not long retained, and if the discharges are not arrested. In many cases, a few grains of quinine (two, three, or four) given at first with each dose of the opium, will cause the latter article to be borne better, and the combined effect will be an improvement upon that produced without the quinine. I have often prescribed pills, containing sulph. morphine one fourth of a grain, and sulph. quinine two or three grains, one to be taken immediately, and repeated once in from one to four hours as may be required; and these doses in a majority of cases will be quite sufficient to arrest all the symptoms. The quinine may be continued until a scruple, or sometimes more, has been given. Mercury, however, should not be omitted where any considerable severity of symptoms exists, and where the cholera tendency is manifest in the colorless condition of the discharges; for, though without the mercury the symptoms may be arrested, they are much more liable, after a few hours, to return when this article is not used. Where mercurials, however, are used with opium, such returns of the symptoms are exceedingly rare. When, by these means, the discharges are completely arrested, the next day a mild laxative of syrup of rhubarb, or of equal parts of the syrup and tincture of rhubarb, or castor-oil, with a few drops of oil of turpentine and tinct. opium, may be given with advantage. A simple opiate should follow its operation, if there be pain or a tendency to a continuance of the catharsis. At the commencement of the treatment, or at any time during its course, a sinapism to the abdomen may be useful. The blandest diet should be insisted upon, and the patient kept quiet until restored. These means are almost as certain to arrest the disease, if resorted to and persevered in, as quinine is to arrest an ordinary attack of intermittent fever.

When the cholera is prevailing, physicians should strongly advise those who depend upon them for medical directions to keep about them medicines adapted to the disease, and should give them instructions respecting their applications in case of emergency; but still, the rule should be to send for advice as soon as possible after symptoms appear. Many lives may in this manner be saved.

But the premonitory stage is sometimes absent, or so slight as not to receive attention, and is frequently so neglected, or so short in duration, as not to become the subject of treatment, and the case passes into the second stage—the full development of the active disease occurs before aid is sought. In the early part of this stage, before the deep blueness occurs, and while considerable warmth is present, especially if the disease seems to be of a forcible character, with severe pain and spasms, the treatment may commence by a moderate bleeding, or, safer, by ligation of the extremities, detaining in that manner a portion of the blood from the circulation. Several cups may be applied over the stomach and abdomen; all drinks, in larger quantities than just sufficient to wet the passages, must be instantly and peremptorily prohibited, and, whether the preceding means be used or not, the following powder administered in a teaspoonful of water:

℞	Opium......................	grs. ij
	Gum Camphor..............	grs. ij
	Calomel.....................	grs. iij. to vj
	Sugar of Milk................	grs. xv
	M.	

Triturate very thoroughly.

The minute division of the medicines by trituration, I regard as very important. Here the sugar of milk is preferred to common loaf-sugar, though the latter will answer. All the ingredients, when thus treated, will diffuse themselves readily, and will be extensively and speedily applied to, and will readily act upon the stomach; while, if the opium and other articles be given in pill or coarser powder, they will be much more liable to be rejected before they have time to act; or if retained, their effects will be more slow and cumulative, and that of the opium may be too profound at a later period, when a powerful narcotism will be liable to be fatal.

If the treatment be commenced at a *very* early period in the second stage, and the circulation and respiration are still comparatively good, a quarter of a grain of morphine may be added to the first dose of the above powder. If there be evidence of matters upon the stomach not rejected, or if there be much cramp and retching, without the power of free emesis, an emetic dose of salt and mustard, or of sulph. of zinc, may precede the administration of the powder, and in that case the temporary calm after vomiting must be seized upon to give the powder. When the vomiting is spontaneous, the calm succeeding it is the most favorable moment for administering a dose. When the dry cups come off, they must either be reapplied, or the regions of the stomach and bowels must be covered with a strong sinapism. Sinapisms may also be applied to the extremities. If the first powder be rejected before it has had time to make an impression or to be absorbed, another should be immediately given, omitting the morphine, however, in the second dose, if the first was retained as long as ten or fifteen minutes, or if there is evidence of any portion of it having been retained ; and after the second dose, it is not usually safe to add morphine to the two grains of opium, however frequent the vomiting may be. These powders may then be continued, sometimes varying the proportions by increasing the calomel and diminishing the opium, repeated once in from *one to three hours*, according to the severity of the symptoms, *until either the discharges are arrested, a perceptible degree of anodyne and narcotic influence is produced, or the blue stage occurs.* After one or two doses of the powder are given, and the vomiting has somewhat abated, and especially if the treatment had commenced at a later period of the disease, three or four grain doses of quinine should be administered once in one, two, or three hours, until a scruple, or half a drachm, or more has been given. Should the discharges be arrested or very materially abated, as they usually are after a short time under this treatment, the stomach will be in a condition to retain other articles, and other indications besides that of arresting the discharges can be attended to. Should a considerable degree of narcotism be present, a strong infusion of coffee must be given liberally, and continued until the symptom is no longer sufficient to excite uneasiness. Should there be much depression, carbonate of ammonia may be added to the quinine, or given by itself, and should the surface be dark, with considerable depression of the vital powers, common salt and the flour of mustard, in doses of from ten to fifteen grains each, may be given once in from one to two hours. At the same time, a few spoonfuls of chicken broth or beef-tea, with rice water, well salted, may be given quite frequently, say every half hour. In the meantime, some fifteen to thirty or more grains of calomel have probably been given in the powders, and if so, no more will usually be required ; but if rice-water discharges still occasionally continue, five or six grain doses of this mineral may be continued without the opium, or with a quantity of it so small as not to be incompatible with the safety of the patient. The extent to which the opium may be safely carried cannot be defined, and must be carefully judged of in each case by all the lights which close observation and experience can afford. If the treatment be commenced later in the disease than we have been supposing, opium must be used more sparingly, and as the point at which treatment has commenced advances toward or into the blue and collapsed stages, less must be used, until none can, with safety or a prospect of success, be given.

Acetate of lead, in from two to four grain doses, may sometimes, perhaps, be beneficially given, alternately with the opium, calomel, and camphor powders, especially if the purging be out of proportion to the vomiting. But the stomach has certain capacities for the enduring of medicines, beyond which it cannot be plied with impunity. We cannot pour promiscuously into that organ, when irritated as in this disease, every article for which there seems to be an indication; and according to my observation, when acetate of lead, by the stomach, has been added to the treatment just described, the effect has not *usually* been so satisfactory as without it. In the condition, however, above referred to, when the purging is more severe than the vomiting, and continues after a partial calm has been effected by anodynes—or in the latter and lower stages of the disease, when this exhausting discharge continues—the effect of *enemata* of the lead, given as directed when describing the treatment of the premonitory stage, with such quantities of laudanum as may be borne, can scarcely be too highly praised. Tannin may be used as a substitute for the lead, is often quite as effectual, and, not unfrequently, is borne better by the stomach when used in that way. I have not unfrequently combined tannin with quinine, where the latter article was indicated, and purging was present, without producing unpleasant effects on the stomach, and with a manifest impression upon the purging.

The above course of treatment, when commenced *before the blue stage has thoroughly set in*, will, according to my observations, in a very large proportion of cases—I should say in fair constitutions in nine cases out of ten—succeed in arresting the disease and procuring a favorable reaction. The after-treatment should be simple.

I am aware that this statement of the success of this treatment is much more favorable than is usually found in the standard works respecting any mode of treating this formidable disease. For this reason the statement is made with some degree of hesitation, and not without due reflection. But a careful review of my own experience fully justifies it. It will be observed that the statement is not that nine out of ten of the cases of cholera, as usually met with in practice, can by any means be saved; for frequently the disease, when the physician is first called, will be so far advanced as to be beyond the reach of any treatment; and occasionally a case will be so rapid and severe as to resist the most prompt and timely measures; but in ordinary cases, in persons of fair constitution, the premonitory diarrhœa occurring and the full attack developing in the usual manner, if the treatment be commenced before the blue stage has supervened, and be followed up with promptness and skill, an exceedingly large proportion of cases will recover.

If the bowels are not open after twenty-four or thirty-six hours from the period of reaction, a gentle laxative of castor-oil, with the addition of small quantities of oil of turpentine and laudanum, or an aperient of some of the preparations of rhubarb, in divided doses, may be given. If the stomach seems loaded with bile, as it not unfrequently is at this period, a gentle emetic of salt and mustard will sometimes procure great relief. If the urinary secretion is not soon restored, or indeed in anticipation that it may not be, when the stomach and bowels become quieted, spts. nit. dulc. may be given in half tea-spoonful doses in water, frequently repeated, or other diuretics may be administered. Bland nourishment and drinks may be allowed, and the patient kept quiet. Sometimes gentle tonics may be useful.

In some rare instances, after not very severe cases of cholera, but rather more frequently after the graver cases, the kidneys fail entirely to perform their functions, and the patient dies comatose from the poison of urea in the blood. Death usually occurs in from twenty-four to forty-eight hours after reaction ; and, according to my observation, when the suppression of the secretion is complete, and comatose symptoms strongly resembling those of an overdose of opium supervene, no means within my knowledge will, as a rule, avert the fatal result. I have tried various stimulating diuretics, electricity, counter-irritation over kidneys, and cathartics, but with little effect.

Where mercurials have been pretty freely used, and alcoholic stimulation has been avoided, it is seldom that severe congestions and inflammations of the brain and other organs occur after attacks which have not passed into the collapsed stage. Whenever these cases do occur, however, treatment must be conducted on general principles, bearing in mind that though there be inflammation, it occurs in a system much debilitated by a severe disease. If the brain and spinal marrow and their envelopes be the seat of the disease, blisters, mercurials, and iodide of potassium would be indicated. If the stomach and bowels be the seat of the inflammation, blisters, a few minute mercurial doses, with small doses of morphine, followed perhaps by a mild laxative of castor-oil, and this succeeded by the following mixture will be well :

℞	Oil of Turpentine,	
	Tinct. of Opium	āā fʒijss
	Gum Arabic,	
	Sugar	āā ℥ss
	Camphor Water	f℥ij
	M.	

For an emulsion. A tea-spoonful once in three or four hours.

These secondary symptoms are varied, and sometimes protracted, requiring a variety of management, often embracing ultimately a general tonic course.

But cases of cholera are frequently not seen until they are far advanced into the cold or blue stage, or have actually passed into the collapsed condition.

While the pulse remains at the wrist there is sufficient hope to demand strenuous efforts, and even after it has disappeared, patients occasionally recover. The practitioner of close observation, of acute discernment, and of much experience in cholera, will be able almost at a glance to determine the probable fate of his patient, for there is a discernible point, beyond which, if he pass, all the chances are against his recovery.

If the condition borders upon the fully collapsed or asphyxiated state, opium, as has already been stated and repeated, must not be given, or only in very small quantities. If the purging still continue, an enema of a solution of acetate of lead (fifteen or twenty grains), with perhaps a tea-spoonful of laudanum, may be used and repeated, with or without the laudanum, as circumstances may require. The cold affusion, or the rubbing in ice, may here be tried, followed by warm frictions, sinapisms, and warm blankets. The fullest inspirations of the freshest air may be insisted upon, and quinine, warm coffee, and carbonate of ammonia, two or three grains of the latter, and the same amount of the quinine, once an hour or two, alternated with doses of from ten to fifteen grains each of salt and mustard, may be given, not omitting the frequent administration of chicken or beef-tea, well salted.

The chlorate of potash would here be suggested as possibly supplying oxygen to the blood, and improving the condition in other respects; and quinine, if not well borne or appropriated by the stomach, may be tried *hypodermically.* My experience in cholera occurred before the hypodermic syringe was in use as now; but this method of administering quinine, morphine, and other remedies, is strongly suggested on rational principles, and I should not hesitate to give it a trial. Dry cupping along the spine may be added to the treatment with advantage. Besides these means, six or eight grains of calomel may be given once in an hour or two, until some twenty or more grains are used, not with reference so much to any immediate effect, as to act after several hours upon the bilious secretion, should the vital powers be kept up for that length of time; for, without that action upon the liver, the cholera discharges are liable to continue or return.

The use of opium in cholera, so essential for the arresting of the discharges, and yet so liable when freely used to interfere with the function of respiration and produce other injurious effects, especially in the later stages of the disease, is of the utmost interest to the physician who expects to meet with this affection, as the chief element of his skill in treating the disease will consist in his judgment and tact in the administration of this article. There is, on the one hand, the Scylla of allowing the intense irritation and profuse discharges to so alter the proportions of the constituents of the blood and exhaust the patient, as to carry him beyond hope, and, on the other hand, the Charybdis of too great narcotism, interfering with respiration and other functions to an extent equally dangerous. It requires skill and tact to steer between these rocks of destruction, and, in treating cholera, this passage must be made.

Of the treatment of the fully collapsed state, I have little to say. I have seen a few such cases recover—that is, cases where the pulse could not be felt at the wrist, and where the loss of voice, the blue and shrunken condition of the surface, the extreme sunken and lustreless eye, and the slow laborious breathing corresponded with the arrested condition of the arterial circulation—but these are exceptions so rare that the influence of treatment is not ascertained.

Some of the most remarkable recoveries of this kind which I have witnessed have been after large and repeated doses of calomel ; but of its manner of producing beneficial effects, or indeed of the fact of its producing any effects at all, I am by no means certain.

In describing the treatment of the active or vomiting stage of cholera, it was mentioned that drinks should be avoided, excepting in tea-spoonful doses, or quantities just sufficient to moisten the mouth and throat, and the subject is again introduced here in order to make it more prominent. This I regard as an essential item of treatment in most cases. The objection to the drinking is, that while fluids in considerable quantities are taken into the stomach, vomiting will continue and medicines will not be retained. A tea-spoonful of ice-water, or a very small piece of ice may be taken frequently, and will answer the purpose of quenching thirst. So important do I consider this point, that I would not take the responsibility of a case—would abandon a patient whose friends would not enforce the restriction where vomiting or the danger of vomiting existed.

Time is so essential in the treatment of cholera, that it is very important that every practitioner have about his person several articles of medicine ; and particularly if the powders of opium, camphor, calomel, and sugar, which I have recommended, be used, they should be carefully prepared, of good materials, thoroughly triturated, and put up in packets accurately weighed. In a large practice much time and many lives may be saved by such precaution.

The views of cholera and its treatment expressed in the preceding pages, are, as already intimated, the result of no small amount of experience (about two thousand cases of the disease during three seasons having come under my careful observation and management), and they are presented to the profession with much confidence in their correctness. The fact is not forgotten that diseases, however specific in their character, are modified in many of their features, and particularly in their severity, and in the influence of remedies upon them, by local circumstances, and what is called the "prevailing constitution of the atmosphere." It is quite possible that further experience in other cholera epidemics, or in different localities, would modify my views as to the selection and efficacy of remedies; but until other and clearer light is thrown upon the subject, and other measures are shown to be more effectual, the course indicated would be pursued with a firm conviction of its being the one most worthy of approval in the present state of our knowledge. If the disease, as it may hereafter appear, shall not differ in its features from those presented during the three years of its prevalence in Chicago, similar results from treatment would confidently be expected to follow. The cases treated were too numerous, were spread over too large a period, and were too frequently compared in their results with those occurring in the same localities and under similar circumstances, but differently managed—the whole series of observations were too carefully made, not to have the conclusions drawn from them held with firmness.

The great desideratum in the treatment of cholera is some means which shall answer an indication above those we now labor to fulfill—that of directly and certainly neutralizing the cholera poison. The present state of pathological and therapeutical science strongly points to the discovery and application of antidotes to specific poisons; and may we not hope that in the advancement of science, the hidden nature of the cholera germ will be revealed, and a remedy be found which will directly and surely destroy its effects? He who shall be so fortunate as to make this discovery must ever be regarded as among the great benefactors of mankind; and in celebrations of the triumphs of medical art his name will be associated and pronounced with those of Harvey, and Hunter, and Jenner.

The preceding account of cholera and its treatment is a reproduction, with but slight modifications, of views expressed several years ago, when my experience in the disease was fresh; and since then I have had no further opportunity of personally observing and studying its character. Much since then has been written, and many authoritative and weighty statements have been made, especially upon its etiology. The views on the subject, so far as they are here expressed, were based upon so much personal experience, so deliberately formed, and so firmly held, that nothing which I have since seen has materially changed them, and I have concluded to let them stand as individual opinions, not attempting a summary of general professional sentiments.

YELLOW FEVER.

This is a specific infectious disease, originating in tropical climates, and as it has prevailed in the United States, the poison has generally, if not invariably, been brought either directly or indirectly from the West India Islands. It has been imported into various places, but never prevails to any great extent except in comparatively low latitudes and during hot seasons.

It is characterized by a comparatively sudden invasion, by a continued type of fever, by a rapid development of severe symptoms, which often, however, have a temporary abatement, generally to return with increased severity; there is usually marked yellowness of the skin, the vomiting of a dark coffee-ground fluid; there is albuminous and often scanty urine, and in a large proportion of cases there is rapid sinking and death.

In several of its features it resembles some severe cases of remitting fever, and has been thought by some to be but a modification of malarial disease. Its distinctive character is now so generally admitted, that no argument is here needed to establish this fact.

The history of yellow fever is unknown previous to about the middle of the seventeenth century, when the first recorded outbreak occurred in those tropical islands where its home has since been, and whence it has issued on so many occasions. In many instances it has seemed to acquire new vigor by its migration, especially when the poison has been carried to densely populated localities where the hygienic conditions were unfavorable—where the heat was great and filth abounded.

In none of the specific diseases where a *materies morbi* has not been identified and demonstrated, are inferences of the existence of such a poison more clear and conclusive than in this; and in none is there more uncertainty as to what it really is. The same arguments which prove the existence of a specific and probably germinal poison in malarial diseases and in cholera, are equally conclusive here; and in no other disease does the existence of certain physical conditions, especially a low temperature and frosts, have so much influence in arresting its continuance. It has raged with great severity in many localities in the Southern United States, and nowhere perhaps more conspicuously than during the years 1878 and 1879 in Memphis, Tenn.

The question as to the contagiousness of yellow fever, as well as of cholera, has often been mooted, and frequently with the same degree of vagueness as to what constitutes contagion. I have had no personal observation and experience with yellow fever, and my convictions are not of the same positive character as in the case of cholera; but from all the information I have been able to gather, I cannot doubt that this disease, like cholera, is dependent upon a specific, material, germinal poison; that such poison probably had its origin outside the human body, and that it certainly is multiplied outside the body, though it may also be multiplied within it—and possibly one stage of its development is necessarily within it, though that is by no means proven; that the germs are capable of being attached to fomites and transported to great distances by ships and other means, and when brought to a locality where the heat, moisture, the presence of putrefying organic material (filth) in the soil and atmosphere are favorable, it multiplies with great rapidity, and affects persons susceptible to its action; that the whole atmosphere of a locality where it prevails contains the poison, and that, as in cholera, those in attendance upon the sick are not particularly more liable to take the disease than others in the same general atmosphere. If by a contagious disease is meant one produced by a poison which is alone generated and multiplied in the bodies of the sick, and transmitted from person to person, yellow fever seems to me not contagious; but the facts are such as to give plausibility to the theory of its being *miasmatic contagious*, according to the meaning given to that expression by Liebermeister. By this is meant a disease produced by a poison which is multiplied outside of the body, and also in some of its stages, or to some extent, within it, but not necessarily and exclusively so.

In the case of yellow fever there is no sufficient proof that the poison originates in the body, or that it must necessarily pass through it, producing the disease, before it affects the system of another; and its exclusive contagiousness, in the sense that small-pox is contagious, seems to me more than doubtful, if it is not positively disproved.

The most important facts to be observed in reference to the prevention and spread of the disease are, that there is a poison which is the cause of the affection, that that poison is portable, capable of being carried to great distances; that it is usually brought to other parts of the world and especially to our country from the Antilla Islands; that the local conditions favoring the multiplication of the poison are heat and filth; and those favoring its operation upon persons are intemperance, irregularities, recent residence in a locality, and absence of protection by previous attacks, and want of acclimation in a region of high temperature. The white race is much more subject to the disease than the colored. In its prevention, strict quarantine of vessels and persons from infected places, whether any on board the vessels are affected with the disease or not, or whether the persons from the infected places are sick or well, is of primary importance; while the greatest pains should be taken to preserve cleanliness, and improve the hygienic conditions of places liable to the introduction of the poison.

While cultivating and manuring a field will not produce a crop of grain unless seed is sown, so sowing seed, however fruitful, upon a barren rock will not produce a harvest. The seed and the soil capable of germinating and sustaining it must be brought together in order to a productive yield. So with the free production and epidemic spread of yellow fever; the seeds in a condition capable of germination must be present, and they must find conditions capable of sustaining and developing them, or a crop of disease and a harvest of death will not follow. The conditions for this growth and its effects are a high temperature, effete or decomposing organic matter (filth), and the presence of unacclimated or susceptible persons.

Symptoms.—Notwithstanding the specific character of yellow fever, it differs much in its severity and particular phenomena in different epidemics and in different individual cases. Sometimes the full complement of standard symptoms is present, sometimes they are imperfect and deficient, and sometimes displaced. At one time the diagnostic symptom is the supraorbital headache. At other times the tongue symptoms are alone diagnostic, or their equivalents are expressed in the uvula and fauces. Intense surface heat, albumen early in the urine, and black vomit are among the later symptoms; and smoky, pale urine, with perfect blood corpuscles, takes the place of the straw-colored or bilious urine, with its sediment of tube casts and epithelial matter. (Aitken.)

In well-marked cases, besides the phenomena common to most severe febrile attacks, often the tongue is red at its tip and edges, with prominent papillæ and a creamy surface. After a time the fur separates from the middle, or lies in wavy flakes; then there is a separation of the epithelium beginning at the tip, proceeding to the edges and down the raphe, and this separation may extend over the whole surface, obliterating the papillæ—the tongue becoming smooth and dryish, and looking like a piece of raw beef. When this occurs, more or less oozing of blood takes place, coating the surface of the mouth, and collecting upon the teeth. The tongue then becomes much smaller and more pointed than in the early stage. Mosquito wounds are said sometimes to present an enlarged area of rose-colored spots, becoming hemorrhagic near the end in fatal cases.

Bloody furuncles occur in some cases, so late, however, as to be regarded as sequelæ, and are commonly situated on the wrists, and along the front of the legs, but may be in other places. On the legs they are often flat, purplish vesications, about the size of a pea, or a little larger.

A variety of *types*, or forms of the disease, have been clinically recognized by different writers. Thus one makes an algid form; a sthenic form; a hemorrhagic form; a purpuric form; and a typhoid form. Others make other groupings; all of which show the variable character of the disease as to particular phenomena.

In what is called the algid form there is the most rapid course and the greatest amount of early prostration of the vital powers, which are evidently overcome by the more direct action of the poison. The patient in his usual health may suddenly feel a shock as from a heavy blow on the back, and fall down into a collapsed state, and die within a few hours.

The sthenic form is in decided contrast with the algid. It is more likely to occur in persons well developed, and in the vigor of life, and is characterized by strongly marked febrile symptoms, a high, full, hard pulse, flushed face, throbbing temples, high temperature, sometimes going up to 107° F., or even more, with severe pain in the head and back—all the symptoms indicating a powerful reacting resistance to the poison on the part of the system.

The *hemorrhagic* type, however, is one of the most characteristic and appalling. In this there is epigastric distress and pain on pressure; but the most marked condition is a tendency to profuse effusions of blood occurring simultaneously from different parts of the body. The cases are fatal at an early period, the temperature not rising as high as in the sthenic forms, and after death the tissues are found infiltrated with blood.

In what is called the *purpuric* form, the fever is well marked, and the conjunctivæ and skin are intensely yellow. Subcutaneous effusions of the coloring matter of the blood with various shades of color, and often with œdema around, constitute the purpuric spots.

In what is called the *typhous* form, a variety of phenomena prevail. In some there is stupor and nervous depression at an early stage of the fever, with other typhoidal symptoms, to which are added the hemorrhagic phenomena; while in others the typhoidal symptoms follow the sthenic fever, or the algid condition, in the few cases where that is survived.

Besides these severer forms, there are, during the prevalence of an epidemic, many cases in which the symptoms are of a mild character, even milder than in ordinary cases of malarial fever.

The numerous varieties presented by this disease have occasioned great discrepancy and confusion in the different accounts given of it. It would protract this article too much to give even a short sketch of the many accounts of the disease which its literature contains, and in the absence of personal experience (this being one of the very few diseases I have not witnessed), proper discrimination could hardly be exercised. With even the ablest writers more or less blundering is often apparent when treating of diseases of which they have had no experience.

Notwithstanding these different varieties, there are some features which are generally present; and a more detailed account of the ordinary symptoms may be given which will apply to a majority of cases, and will give a clearer picture of the common forms of the disease.

An attack of this fever, as already stated, is usually abrupt. In some cases, however, the more decided symptoms are preceded for from one to three days by languor, loss of appetite, headache, and chilly sensations. The full attack is generally marked by a chill of rather moderate intensity, succeeded by increase of temperature and the other common symptoms of the febrile state. The intensity of the fever varies in different cases; in some it is high, and in others the heat of the surface is not much raised, and the pulse does not exceed 100. The tongue is moist and more or less coated. Vomiting may occur early, but is rarely present until a later period of the disease. There is tenderness on pressure over the epigastrium, the bowels are generally constipated, there is usually pain, sometimes intense, in the supraorbital region, in the back and lower limbs, especially in the calves of the legs—the lumbar pains having an analogy to those of small-pox. The mind is usually clear, though there is sometimes delirium, which is very seldom violent, however, and is sometimes mirthful. "The eyes are reddened, irritable, watery or tearful; this is quite constant, and so marked as to constitute a diagnostic feature." (Flint.)

The fever continues for a period varying from a few hours to three days, when there follows an abatement or an entire cessation of it, and what is called the "state of calm," or sometimes the "stage of reaction," occurs. Some regard the stage of feverish excitement as constituting the disease proper, and all that follows as its sequelæ.

In some cases the cessation of the paroxysm of fever is the beginning of convalescence, which goes on to recovery. In the graver cases it is delusive; and after a period of some hours, or a day or more, new symptoms are developed, which are more distinctive of the affection than those which preceded. The pulse sometimes falls below the normal in frequency, and is often small, weak, and sometimes vibratory. The surface is often cool, especially of those parts which are uncovered, and capillary congestion may be marked.

Vomiting, if not already present, now comes on and is decided; and in a large proportion of fatal cases, and in some that recover, the matter vomited is very dark in color, resembling well-burned coffee grounds. This "black vomit," taken with other symptoms, is pathognomonic of the disease. This characteristic matter is due to the presence of blood, changed by the action of the gastric juice. Sometimes this vomited material is red in color, the blood having undergone but little change; it is generally acid in its reaction, and comparatively unirritating, though in rare cases it excoriates the throat and other parts with which it comes in contact. It is more or less abundant in different cases, is ejected sometimes with force, at other times it seems a mere act of regurgitation; and it commonly ceases in fatal cases in from twelve to twenty-four hours before death. This black vomit which rarely occurs until the first stage is passed, is often preceded by vomiting of a limpid or opalescent matter; and the tenderness of the epigastrium, so often present in the first, is aggravated in this second stage, and is sometimes extreme. The tongue, sometimes reddened, dryish, and raw in appearance, as already described, is in other cases moist and covered with a creamy coating; and sometimes it preserves a nearly natural appearance. During this second stage the discharges from the bowels are frequently dark, or nearly black—of the appearance of molasses or of tar. This dark appearance is also due to the presence of altered blood; and when the functions of the kidneys are seriously interfered with, as is often the case, the constituents of the urine, such as uric acid and the triple phosphates, are to be found in the stools. Diarrhœa seldom occurs, meteorism is generally absent, and the abdomen is soft.

Albumen in the urine is a very frequent, and an almost constant condition in severe and fatal cases, and frequently blood corpuscles and casts of uriniferous tubes are also found, and the perverted function of the kidneys is among the causes of the great mortality which attends this disease. A scanty secretion, and sometimes total suppression occurs in fatal cases, with the consequent retention of urea and other effete matters, and this poisonous action is an important feature of the disease. In the severe cases the urea and uric acid diminish and at length disappear, and are sometimes replaced by leucin and tyrosin, while albumen appears, and, as the disease advances, increases in amount. Usually the urine is of a deep color from the free quantity of blood pigment and bile pigment which it contains.

The yellowness of the surface, from which the disease derives its common name, comes on in the second stage. The conjunctivæ also become yellow at the same time, and this, together with the previous redness, gives a peculiar and characteristic expression to the eyes.

The jaundiced appearance of the skin and conjunctivæ is due to the presence of biliverdin, and the perverted function of the liver contributes to the severe and fatal effects.

The yellowness is present only in a portion of the cases, mostly in those of a severe character. It continues after death, and in cases of recovery into the convalescent stage.

In most severe cases there is hemorrhage into the stomach, bowels, and kidneys, and in the specially hemorrhagic cases from many other parts, as already described.

Coma and convulsions occasionally occur, as would be expected from the uræmia which accompanies the disease of the kidneys; and delirium, though generally absent in the second stage, is sometimes present. Occasionally the patient fancies himself well, or but slightly ill; and though muscular prostration is usually great, in exceptional cases he keeps up until almost the last.

The physiognomy is much relied on by those familiar with the disease as a means of distinguishing its presence; while a peculiar odor is regarded as in a measure diagnostic. So many descriptive epithets are applied by writers, that it is difficult to obtain an impression of all its peculiarities without seeing cases.

The duration of this second stage varies from a few hours to a few days; and when it is survived, a *third stage* supervenes, which may be one of collapse and exhaustion, or of convulsions and coma, or of great restlessness, or an apparent freedom from suffering, all terminating in death; or this may be a stage of improvement resulting in convalescence.

When patients recover from the first stage, or that of the primary fever, the convalescence may be rapid; but if they pass into the second stage, with black vomit and other severe symptoms, such pathological changes have occurred as to render convalescence slow, and it is often accompanied with low typhoidal symptoms. Relapses are said sometimes to occur after convalescence seems to be advanced.

The mildest forms of the disease present no very decided characteristic symptoms, and some can only be distinguished as yellow fever by its general prevalence. These are the cases, very numerous in some epidemics, which furnish statistics of great success with special modes of treatment. Those not very ill may often trust themselves to infinitesimals or to some particular nostrum, and statements of the success of treatment, if credited, are often very deceptive.

In some instances great success in the treatment of Asiatic cholera has been boastingly reported by those who were employed chiefly in the treatment of the diarrhœas, always so prevalent during an epidemic of this disease. Such cases have been reported as cholera, and an immense proportion of recoveries has been attributed to the particular professed methods of treatment. Those having the opportunity of observing have testified that similar unfounded statements have been made in reference to the success of the treatment of yellow fever; but such false statistics can deceive those only who are unacquainted with cholera, with yellow fever, and with the devices of unprincipled pretenders.

Morbid Anatomy.—The morbid appearances *post mortem* are, as the clinical history would suggest, móst conspicuous in the stomach and other portions of the alimentary canal, in the liver, and the kidneys. The stomach generally presents redness, softening and thickening of the mucous membrane, or ecchymozed or purpuric spots, or the condition described as mammillation. The epithelium is usually intact. These appearances are not uniform, and some that have been described are probably cadaveric.

The intestinal canal, in some cases, presents the appearance of redness in patches, and also points of ecchymosis and of softening; and similar appearances are sometimes observed in the œsophagus. Both the stomach and bowels often contain more or less of the black materials already described. The liver, in cases which continue long enough for the full development of the disease, is quite uniformly changed in appearance. In most instances it is unnaturally yellow or fawn colored, suggesting an acute fatty degeneration of the organ. On minute examination this is found to be the case. There are fatty infiltrations and fatty degeneration of the hepatic cells, and, in advanced cases, there is a great abundance of fat-cells and granules.

The kidneys, where albumen and blood are found in the urine, we should expect to find congested or inflamed, or in otherwise altered conditions, and such is generally the case. Hyperæmia is very commonly present; the tubules, both straight and convoluted, have their epithelium affected with granular degeneration; and, in the protracted cases, extended fatty degeneration follows.

According to the accounts, however, there is not uniformity in this respect; and in the present state of knowledge the morbid anatomy does not offer a satisfactory explanation of all the phenomena of the disease.

Nothing distinctive of the disease is found in the nerve-centres, though, as in other fevers, there are variations as to quantity of blood, and sometimes there are effusions. In the hemorrhagic varieties especially, extravasations of blood are found in the lungs and other organs, and sometimes upon their surfaces, as would be supposed. The morbid anatomy and histology of the disease await a more full investigation.

Diagnosis.—The diagnosis is to be made by carefully observing the phenomena which have already been described. In the milder cases, and in the first stage of the more severe forms, all agree that the diagnosis, especially in the first cases of an epidemic, before its established prevalence furnishes any aid, is often very difficult.

The cases that convalesce from the first stage would not generally be considered yellow fever, were not the disease prevailing, so strangely do many of them resemble febricula or accidental fevers. Other cases, however, present symptoms in the first stage more or less diagnostic. These are, abruptness of the attack, severe pain in the back and limbs, and suffusion or redness of the eyes. As the disease advances to the second stage, the diagnosis cannot, in a majority of cases, be difficult. It is perhaps more likely to be confounded with remitting fever than with any other affection, but a careful comparison of their respective phenomena will make the distinction possible. Malarial fevers are thought to be sometimes associated with yellow fever, modifying the latter in its phenomena. Such an association would influence the treatment.

Prognosis.—The general prognosis must be grave, as, according to the estimate of Dr. La Roche, the average mortality is 1 in 2.32. However, the rate of mortality differs greatly in different epidemics, and in different periods of the same epidemic, usually becoming less severe toward the period of its decline.

The yellowness of the surface, the black vomit, the suppression of urine, and a general hemorrhagic condition, are unfavorable indications. An early collapsed condition is, of course, indicative of a speedy unfavorable result, and coma and convulsions are evidences of very dangerous if not fatal uræmia. The favorable symptoms are a moderately slow pulse and moderate temperature, and a quiet stomach. Streaks of fresh blood during the black vomit, if the corpuscles are entire, are considered favorable. If the urinary secretion continues, and the vomiting is slight or abates, there may be hope. The urine simply albuminous is more favorable than where casts abound. A free, copious discharge of urine, however loaded with bile or blood, is a favorable sign. In cases of moderate severity unfavorable events are liable to occur, so that the prognosis should always be guarded.

Treatment.—No part of the task of writing on yellow fever is so difficult and unsatisfactory as that of attempting a description of its proper treatment.

As is the case in most other specific fevers, no reliable antidotal remedy has yet been discovered, and no course of treatment can be depended upon to cut short the disease. Quinine and opium have been claimed as acting antidotally, or as abortives, but the continued high rate of mortality seems to negative all such claims. That these remedies are often useful there may be reasons for believing; that they will arrest malarial fevers, which are sometimes mistaken for yellow fever, is quite certain; and that they may exert a decided control over some complications, is exceedingly probable; but their effects in genuine and severe cases of this disease must be regarded as uncertain, if not entirely doubtful.

From the fact that many cases are mild and tend to recovery, while others are malignant and certain to terminate in death, the effect of any treatment in a given case is exceedingly difficult to determine. The numerous remedies that have been accepted and rejected, praised and condemned, confirm this statement.

As there are no specifics, the treatment must be guided by the rational indications present. It is an object to keep the bowels open, and to induce the skin and kidneys to act as freely as possible, with the hope of carrying off injurious materials and relieving internal congestions. Excessive action of any organ should be abated, and the different functions, as far as possible, should be regulated.

The sthenic cases may require sedatives, as the wet sheet or cool bath. In all ordinary cases there seems to be a concurrence of testimony in favor of inducing and maintaining a free action of the skin. The use of cathartics, though questioned by some, is regarded by most as important; at least such use as is necessary to effect moderate evacuations, and to keep the bowels free from fæcal accumulations. Some prefer the free and repeated use of enemas, exciting gently an extensive portion of the colon by the use of one and a half pints of warm water in which a table-spoonful of common salt has been dissolved, adding also a table-spoonful of olive oil, or, in some cases, a drachm or two of oil of turpentine. Demulcent drinks are also regarded favorably when the redness of the tongue indicates a denuded or inflamed state of the mucous membrane of the stomach and bowels.

The food should be of the blandest kind—chicken-tea, arrow-root, barley-water, well-cooked gruels, with milk, to which lime-water may be added—taken in moderate quantity at a time, and repeated as the stomach will bear. The irritation of this organ should be allayed by all means possible. A few drops of chloroform in water, or an appropriate dose of *chlorodyne*, or a quarter of a grain of carbolic acid repeated once in two hours will often be of great service in producing that effect. All drastic medicines should be avoided, but small doses of calomel may be given, often combined with moderate doses of morphine, especially where the pain is severe.

In the specially *sthenic* cases blood-letting has been practiced, and with alleged advantage. Where this was practiced convalescence was slower, but the immediate effect was thought to be beneficial. Leeches and counter-irritation over the stomach have also been applied with some benefit in these cases. Warm baths, cupping over the kidneys, and diaphoretics seem to be indicated at the period when the congestion of the kidneys is likely to result in diminution and suppression of the urine. I am unable to say to what extent it has been tried, but the use of jaborandi in such cases, from the analogy of its effects in other diseases, would seem to be worthy of a trial. Acetate of ammonia, potash, and soda have also been suggested. When the temperature is high, the cool bath, or wet pack, or sponging should be tried, and antipyretics—quinine, salicylate of soda, etc.—may be used by enema, if the stomach will not tolerate them. The stomach is generally too irritable to bear large doses of these medicines by the mouth. In the mild cases very little treatment may be required. Patients should at once be put in bed, calm and rest should be secured, perspiration should be induced, a dose of castor-oil should perhaps be given, and the case carefully watched, as the mildest cases may become severe; and whatever symptoms may arise should be met with such palliative measures as may seem indicated and can be borne.

The free use of calomel has been advocated by some as of great importance, but others question its utility, and the testimony respecting its beneficial effects is not conclusive.

Whenever a malarial influence is combined with this disease, there can be no question about the propriety of using prompt antiperiodic doses of quinine; but its usefulness in other cases, as before stated, is not established. Counter-irritation, especially over the epigastrium when the stomach is irritable, tender, and congested, may be of material service in relieving internal determinations of blood.

Chlorine mixtures, such as are recommended in scarlet fever, have been advised by some.

In the malignant cases all measures fail—at least to do more than palliate some distressing symptoms. In all cases where great suffering is experienced, anodynes may be given as may seem to be required. In short, while the physician, like the mariner, is unable to allay the storm, he must give his attention to managing, as best he may, to prevent the foundering of his craft. This, unfortunately, in yellow fever, he is too often unable to do.

Various more radical measures have from time to time been advised; but the efficacy of no active perturbing agent has been established. Palliating and sustaining measures—meeting prominent indications on rational principles—are all that the present state of knowledge enables us with confidence to advise.

The convalescence often requires to be managed with care. The stomach is frequently left in a debilitated and a more or less seriously injured condition, requiring a regulated diet and frequently other palliative measures.

It is a gratifying fact that some of the diseases, such as small-pox, plague, and yellow fever, which are least under the control of curative agents, are most under the control of preventive means; and so much more can be done in the way of prevention than of cure of this disease, that preventive measures should command the best attention of the profession and the judicious aid of governments. This, it is gratifying to know, the subject is receiving.

Since the preceding account was prepared, Dr. Domingas Freire, of Rio de Janeiro, has published a volume, in which he gives an account of his researches in yellow fever during an epidemic, which, if confirmed by further investigations, will constitute the most important contribution yet made to our knowledge of the pathology and treatment of this disease. He states that he has found in the vomit of patients great numbers of bacteria and of round cellular organisms, to which he gives the name "cryptococcus xanthogenicus." He has cultivated these microzymes and studied their development, and finds it corresponding with the stages of the fever. He has found the blood of patients to contain these organisms, and that at the time of the breaking up of the cryptococci a large quantity of yellow pigment is liberated, which colors the skin and the liquids, and produces a broken-down state of the blood, which favors hemorrhage.

The organisms are then in a quiescent state for a time, and this corresponds with the calm of the disease.

When the third stage supervenes, which is generally fatal, with profuse hemorrhages, small thready pulse, delirium and sinking, the blood, according to Dr. Freire, "can hardly be said to be blood, but an unformed mass of cryptococci, bacteria, vibriones, and débris of all sorts."

Regarding these organisms as the cause of the disease, Dr. F. has attempted to destroy them at an early stage of the fever by the use of the salicylate of soda. He reports eighty-eight cases treated, during the first three days of the affection, with the salicylate of soda, used by hypodermic injections in varying quantities from three to eight grains up to sixteen or twenty, with eighty-three recoveries, or a mortality of only seven per cent.

The author promises farther accounts of his researches and the results of his treatment, and if the latter should prove as favorable as those reported, a great advance will have been made in the successful management of this formidable disease. Salicylate of soda can be given by the stomach in free quantities with safety, and this mode of administration may be found proper to be combined with hypodermic injections.

ERYSIPELAS.—ERYSIPELATOUS FEVER.

Erysipelas is sometimes a primarily local affection, depending upon a local cause, but it is also sometimes an epidemic fever, dependent upon a cause which primarily impresses the general system. As a local or traumatic affection, depending upon wounds or local injuries, it belongs to surgery, and is more appropriately treated of in works on that branch of medical science. As a general affection with local manifestations—as a specific fever—it belongs to medicine, and as such it will be chiefly considered here.

In the article on cerebro-spinal fever, erysipelas was mentioned as a complicating element, and its relations to that affection were considered.

As a general disease, erysipelas may be defined a specific infectious fever, accompanied by inflammation of a peculiar type affecting the skin and subcutaneous tissues, and sometimes the mucous membranes, serous surfaces, and other deeper tissues and internal organs. The fever is usually of an adynamic type, the inflammation has a tendency to spread upon surfaces, and to produce aplastic exudates. It sometimes appears as an epidemic, prevailing over considerable areas, but is more frequently a local epidemic confined to particular localities.

When erysipelas occurs as the result of a wound or injury, or spreads from a previously inflamed point, it is regarded as a symptomatic or secondary affection, and is generally spoken of as *traumatic* erysipelas. When it occurs without such local cause, coming on spontaneously and as the primary affection, it is said to be *idiopathic.* When occurring in connection with wounds, it is sometimes induced by matter transferred from a patient with erysipelas, and applied to the wound by the instruments or hands of the surgeon or attendants ; and such erysipelatous matter or some form of poisonous material appears to invade a locality, as a hospital or a particular neighborhood, and infect the wounded and others through the air. In some cases this is not only infectious but contagious, particularly the phlegmonous variety, demanding great care as to isolation and the avoidance of the transferring of the poison from the diseased to the injured—to parturient or puerperal women, to newly born children, and to others less susceptible than these to its effects.

It not unfrequently occurs "spontaneously" or "idiopathically," that is, without a wound or any abraded surface or previous disease in the patient; commencing with general feverish symptoms, soon followed by the local inflammation, and evidently produced by some influence which operates upon the general system. This influence sometimes spreads in such a manner as to induce an epidemic prevalence of the disease, and to manifest the character of a specific infectious fever.

But from whatever cause induced, whether it be a local disease, as Hebra believes it always is, or whether it is sometimes a general disease or a specific fever, as it certainly seems to be; whether a specific poison produces it, or it occurs from some general condition of the system tending to such morbid action; under whatever circumstances appearing, it presents certain peculiar characteristics which require description, and demand the attention of the physician as well as the surgeon and accoucheur.

The earliest local change consists in a circumscribed blush or congestive redness, soon followed by inflammatory effusions (serum, lymph, and corpuscles) in the substance of the skin and the subcutaneous tissue. This hyperæmia and effusion give rise to swelling; this swelling extends by continuity, generally with a clearly defined margin, though sometimes it shades off into the healthy skin. According to the original smoothness or roughness of the surface, it may be glossy and shiny, or the markings may be exaggerated. The extension varies in rapidity, it is generally gradual, often less than an inch in twenty-four hours, though sometimes more rapid, and occasionally it breaks out on distant points from time to time, when it is called "erratic." As it gradually extends, the parts first affected begin to fade, resolution and desquamation following, and, in some instances, a large portion of the body is thus traversed.

The depth and intensity of the inflammation vary in different cases, and the exudates may be more or less abundant, sometimes producing an œdematous swelling, and at others free suppuration taking place; but when thus effused, the pus, not being confined by plastic exudates in a distinct cavity or well-defined abscess, is infiltrated into the cellular tissue, producing what is called "boggy" swelling, and is apt, under fasciæ or in loose textures, to extend to considerable distances from its original seat. Sometimes, especially about the eyelids and other parts of the face and head, the pus is found collected in more distinct abscesses.

In other cases sloughing of connective tissue and of other structures take place, and more or less wide-spread destruction results. In one case under observation, sloughing of one parotid gland occurred, with recovery and a permanent deep cavity behind the angle and ramus of the jaw. Sometimes serous and corpuscular, and occasionally purulent, exudates occur on the surface of the true skin and under the cuticle, constituting vesicles, bullæ, or pustules; and the disease with these appearances is called E. vesiculosum, E. bullosum, E. pustulosum, or, when the exudate dries down into scabs, E. crustosum, according to the condition and appearance presented. Bullæ containing sanious fluid, when superficial gangrene and subcutaneous sloughing occur, are often present, and sometimes when the lesions are not so severe.

But erysipelas is not confined to the skin and tissues near it. It may extend to mucous or serous membranes, or, in fact, during an epidemic of the disease, internal parts may be the only seat of an inflammation unequivocally erysipelatous in character. The mucous membrane of the fauces, larynx, bronchi, or of the stomach, intestines, and any part of the alimentary canal, and the serous membranes as well—the pleura, pericardium, peritoneum, and meninges of the brain and spinal cord—may be either the primary or secondary seat of this peculiar kind of inflammation. Sometimes a cutaneous and an internal erysipelas are present at the same time, but they are not apt to rage with equal severity, one or the other generally yielding to the counter-irritating effects of its apparently opposing condition.

In erysipelas the veins, and especially the lymphatics, have a marked tendency to become affected. Red lines are frequently seen in their course, their glands are likely to be swollen and tender; and some authors are of the opinion that the primary seat of the inflammation is in the lymphatic system.

Phlebitis, with suppuration around and within the veins, occasionally takes place, and embolism and pyæmia may follow.

Some persons are subject to repeated attacks of cutaneous erysipelas; and in these it is sometimes very superficial, shading off into a mere congestive blush or merging into an erythema.

In the early stage of erysipelas the blood contains an excess of fibrine and of white corpuscles, and later, as the disease continues, the blood tends to assume the appearance found in other low forms of fever. "Post mortem it is generally found dark and fluid, or pitchy, with little tendency to coagulate and still less to the separation of fibrine." As is so common in low specific fevers, the internal organs are generally soft, and the liver, kidneys, lungs, and especially the spleen, are congested. Decided parenchymatous inflammation of the lungs and other organs is sometimes found. The general symptoms and progress of the disease vary much according to the locality of the inflammation and the severity of the attack. In some of its epidemic forms it assumes a malignancy which few other diseases possess. In other cases it is comparatively mild and devoid of danger. When it affects internal organs it is always fraught with much danger from its great tendency to spread over large surfaces, and its course is often rapid toward a fatal termination.

In idiopathic erysipelas the local phenomena are generally preceded for several hours, or for two or three days, with feverish symptoms, such as morbid sensations, loss of appetite, general pains, rigors, and increase of temperature. The disease in such cases cannot be entirely local—there must be some general morbid condition manifested by general symptoms finally resulting in the local phenomena. In ordinary sporadic cases the most frequent point of attack is some part of the face, particularly the bridge of the nose and adjoining regions. A blush of redness is seen, soon followed by obvious swelling, and accompanied by heat, tingling, and tenderness, and by an increase of the general temperature. There are headache, general pains, sometimes rigors, dryness of skin, increased frequency of pulse, furring of tongue, thirst, loss of appetite, high-colored urine, etc., the ordinary phenomena of a febrile movement. If the case be mild the inflammation may extend only over a part of the face, and convalescence may soon occur. If the inflammation continues to spread and increases in severity, the pulse becomes more rapid and often feeble, the tongue more thickly coated and dry, and more or less delirium is apt to come on. The local disease may spread over the face and scalp and extend down upon the chest. Low typhoidal symptoms are apt now to supervene, delirium becoming more marked, the sleep more heavy and comatose, but fitful and disturbed. Sometimes a diarrhœa with involuntary discharges comes on; but in the course of from six to ten days improvement generally begins, the inflammation has already subsided at the point where it commenced, it ceases to extend, and convalescence in a few days is established. In other cases the inflammation may have affected deeper parts, may linger in its original seat, suppuration may occur, especially about the eyes and in the lids, which have been closed by the swelling; or the disease may continue to spread down the neck and upon the trunk, with more distinctly typhoid symptoms well marked, such as great prostration, low muttering delirium—though sometimes more violent—a dry dark tongue, and want of control over the evacuations;

and as the condition becomes still worse, the temperature may rise still higher, the skin may be bathed in sweat, the pulse rapid, weak, and perhaps irregular, and soon nearly imperceptible, the respiration quick, superficial, and noisy; the delirium is succeeded by coma, and death soon follows. Sometimes, however, from very low conditions the patient rallies, and convalescence, after a protracted struggle, is at length established.

In this erysipelatous, as in other fevers, the temperature is always above the normal, with the usual evening exacerbations, but it seldom rises above 106° F. When the inflammatory condition extends to any of the internal parts already mentioned, it is indicated by appropriate symptoms, and of course adds greatly to the danger. When it involves the throat, œdema of the glottis is very liable to occur, and death by suffocation may be sudden and unexpected. When the membranes both of the brain and spinal cord are involved, the phenomena of cerebro-spinal meningitis occur; if those of the brain alone are implicated, there will be the symptoms of cerebral meningitis; if the inflammation is confined to the membranes of the cord, there will be the corresponding symptoms of spinal meningitis; and when other internal parts are affected, corresponding symptoms will be manifested.

When the local disease is confined to the cutis, it is called *simple erysipelas;* when it affects largely the subcutaneous tissue, it is called *phlegmonous erysipelas;* and the terms *œdematous, suppurative,* and *gangrenous,* are applied to the corresponding conditions designated. These are not distinct forms of the disease, as they run into each other according to the severity of the case, the general type it assumes, the previous condition of the system, and other circumstances.

Prognosis.—When internal organs are involved, the prognosis is always very grave; but in a large proportion of cases of external or cutaneous erysipelas, under proper hygienic conditions, and with proper treatment, recovery takes place. The phlegmonous and gangrenous forms are much more formidable than the simple.

Diagnosis.—The diagnosis is easily made in a fully developed case; but in its earlier stages and milder forms it may be confounded with erythema and urticaria, with the early stage of carbuncle, and with simple, diffuse, and superficial inflammation; and in its epidemic and internal forms with cerebro-spinal meningitis, with which sometimes it has some close relations, and with simple inflammation of various internal organs. The disease may commence in the throat, when it may be confounded with tonsilitis, pharyngitis, diphtheria, stomatitis, etc.

Its external forms are to be distinguished by its progressive spread, by the infiltration and swelling of the skin presenting a well-defined margin, while the redness shades off into the healthy skin; and by the subsidence of the inflammation in a particular part, after the third, fourth, or fifth day, though it may be extending at its margins. A careful comparison of its phenomena with those of the other diseases which it resembles will serve to distinguish it.

Treatment.—The prophylaxis of erysipelas is suggested by what has been stated of its causation and mode of occurrence. Isolation, cleanliness, ventilation, disinfection, etc., will be required as in other infectious diseases. It is frequent in hospitals under bad hygienic conditions, and is greatly influenced, especially in its traumatic forms, by imperfect sewerage and all sources of filth. There is an intimate relation between it and some forms of puerperal metritis, peritonitis, phlebitis, and lymphadenitis; and great care should be taken that none of the matter, in however intangible a form, be conveyed by the hands, the clothing, or the hair of the accoucheur, to the parturient or puerperal woman. When erysipelas is prevailing epidemically, puerperal women are exceedingly liable to the affections above indicated, and very severe and fatal forms of these affections are likely to occur, and therefore the most careful preventive precautions should be observed.

The curative treatment of erysipelas is divided into *local* and *general.*

For abating the severity of the local inflammation and arresting its spread, a variety of applications have been strongly recommended and extensively used. For stopping the spread of the disease. nitrate of silver, applied in substance by the stick, or in strong solution at the margin of the inflamed surface, covering a band of the diseased and healthy skin, and to a sufficient extent and of sufficient strength to cauterize several lines of surface, has long been a favorite mode of treatment. Another method has been the application of a blister of cantharides over a similar surface. Still another, similarly but more extensively applied over the whole inflamed surface, and to a greater extent on the sound skin, is the tinct. of iodine; and still another, with the same object, is a strong solution of bromine. This latter article was used in some of the military hospitals during our late civil war, and was favorably reported upon by Dr. M. Goldsmith, Surgeon U. S. Volunteers. It was used of various strengths, according to the nature of the case and the locality of the disease. A continuous application with lint, covered by oil silk, was made to the face, of the following strength: ℞ Bromine, ʒj; Bromide Potassium, ʒss; Water, ℥x.—M.

Much stronger solutions, up to nearly the full strength of the bromine, in gangrenous cases were applied by a swab once in four to six or eight hours; and in my own experience these applications have seemed to arrest the progress of the local disease.

Considering erysipelas as a local affection, these applications which make a strong impression directly at the point of the spreading disease, and thoroughly change the action there, would seem to be founded on rational principles, and it is found that they sometimes quite promptly check the spread of the disease. But erysipelas is certainly not always an entirely local affection, and these articles not only often fail to mitigate the general symptoms, but also fail to check the local spread of the affection. When there is a strong general tendency to the continuance or spread of the inflammatory process, it overleaps the bounds attempted to be set for it, and in some cases the lesions produced by these applications seem to be the points of departure for a more vigorous progress.

Solutions of the sulphate of iron, acetate of lead, and various similar discutient applications have been advised, but their utility, as a general practice, is doubtful.

A poultice of bruised cranberries has a reputation as a domestic remedy, and I have not unfrequently seen it applied when it seemed to have an effect in checking the disease. The local application of tinct. of iron is frequently used, and is thought to be particularly useful in some cases.

The following application has been strongly recommended in facial erysipelas. Carbolic acid and alcohol, āā, one part; oil turpentine, two parts; tinct. of iodine, one part, and glycerine, five parts—the inflamed skin and its vicinity to be penciled with it every two hours. It is said to produce no pain, and the skin next day is usually found pale and wrinkled. The penciled parts should be covered by a thin layer of wadding. In many cases protecting the inflamed surface by sprinkling over it dry flour, or some other unirritating powder, or covering it with dry cotton wool, will be all the local application required.

Whenever pus forms, as it is so apt to be widely diffused, it should be immediately evacuated by a free opening, and antiseptic dressings may be of decided use. Poultices with which chlorine or carbolic acid is mingled, or dressings with carbolized oil, with washes or injections of solutions of permanganate of potash may be indicated. When great tenderness of the tissues occurs, and there is danger of gangrene from restriction of the circulation, free incisions may be required.

But as erysipelas, at least in many cases, must be regarded as a general rather than a strictly local disease, general remedies should not be neglected. As in most other febrile affections, the treatment may be properly commenced by the administration of an eliminative cathartic, which will increase the secretions, and clear the alimentary canal of any irritating materials. After this, besides administering such palliative remedies as particular symptoms may require, and attending to the proper administration of food, and regulating all other hygienic conditions, two articles of the Materia Medica present themselves as claiming particular attention. These are the tinct. chloride of iron and sulphate of quinine. I am very confident that both of these articles are capable of exerting a decided influence over the course of erysipelas. The tinct. of iron has perhaps the higher reputation, and has been more extensively used. In order that its full effects may be realized, it should be given in free and repeated doses, and persevered in until the symptoms are controlled. The proper quantity is from thirty to fifty minims, and sometimes even a drachm, once in from four to five hours. Given in these doses it will seldom fail to check the severity and shorten the progress of the disease; and its effects are so manifest in many cases, as to have given the impression to many that it acts as a "specific" in this affection. During its use, the bowels should be kept open, generally by the occasional administration of a cathartic or laxative; and anodynes or diaphoretics, as occasion may require, are not incompatible with its use. Quinine also has decided effects upon the fever which accompanies the progress of the disease, and which is often of a high grade and needs to be controlled. It also has an effect upon the increase of leucocytes, and the tendency to suppuration; and, in short, upon the whole process of the fever and the inflammation. In order to its full beneficial effects, decided doses must be given, as from four or five to seven or eight grains, or more, once in from three to five hours, and it must be continued at least until its antipyretic effects are realized, when its anti-inflammatory effects will also be produced. As to the comparative efficiency of these two remedies, it may not be easy to decide. The quinine is more efficient in diminishing feverish heat, quieting the circulation, and inducing perspiration; while the tinct. of iron may operate more specifically in counteracting the peculiar erysipelatous inflammation, or possibly in operating antidotally upon the poison which must be supposed to be present, in many cases at least, as a cause of the phenomena.

While the action of two powerful remedies at the same time often tends to produce confusion and less certain results, combinations are sometimes very efficient, and there appears no incompatibility, chemically or therapeutically, between these agents, and I know of no serious objections to their simultaneous administration. In this peculiar form of inflammation and fever, one or the other, or both of these agents should be resorted to, as clinical experience may sanction their efficacy.

Should great depression exist, alcohol is generally advised, and may be important in patients accustomed to its use; yet it must not be forgotten that the habitual, and especially the free indulgence in alcohol renders erysipelas much more severe and dangerous, and that there are doubts as to the directly stimulating and sustaining effects of this article in debility and exhaustion. If used, the same rules should be observed in its administration as in other low forms of fever.

Should symptoms of pyæmia occur, they should be met as in other cases, but no two agents are probably more important in this condition than the quinine and iron. When there is great suffering and restlessness from any cause, anodynes may be required. Bromides may be useful in cerebral excitements, and also belladonna or atropine; and eliminatives, such as diuretics, diaphoretics, and cholagogues, as well as laxatives, when the excretions are deficient, may be required.

When internal organs are attacked, the same general means should be used, for the same disease is to be contended with; but they may be modified to meet particular conditions. When external and internal erysipelas are present at the same time, no direct or local efforts should be made to suppress the external affection; and when internal parts alone are involved, external irritation with sinapisms and blisters is well worthy of a trial. A patient after a severe or protracted attack of erysipelas is left debilitated and anæmic, and a good diet always, and tonic medicines often are indicated. Throughout the course of the disease, as much food as can be readily digested and appropriated should be given, and all the hygienic regulations proper in other severe acute affections should be observed.

PYÆMIA AND SEPTICÆMIA.

The word pyæmia literally signifies pus in the blood; and septicæmia signifies septic or decomposing or putrefying matter in that fluid. The terms, however, are often used as indicating the same general condition, viz., an acute and severe febrile disorder, due to the entrance into the blood of certain poisonous materials, or morbid organic matters, generally developed in the system by inflammatory processes or necrotic conditions. There is commonly the production of clots or emboli, which carried to the minuter vessels block up the arterioles of the lungs and other organs, and produce in them scattered patches of congestion, hemorrhage, infarction, inflammation, suppuration, or gangrene.

The fever is of a peculiar type, usually marked by a sudden access, ushered in by a severe chill or rigor, accompanied or followed by decided elevation of temperature and free sweats. A remission then often occurs, to be followed in some hours by repetitions of the chills and sweats, which return at irregular intervals again and again. The high temperature and the sweating are present at the same time, the tongue becoming dry and hard, the pulse rapid and feeble, the bowels, which are often irritated, producing a diarrhœa, the vital powers often speedily declining, and death being the common result.

This condition is more common in surgical than in medical cases, and for a more full account of it as occurring in connection with injuries and operations, the reader is referred to works on surgery. The conditions, however, are numerous which give rise to pyæmia, and the accoucheur and gynæcologist often meet with it, and not unfrequently the physician, as well as the surgeon. It is a frequent result of injuries, such as burns, scalds, bruises, lacerations, and compound fractures, especially of the long bones, and those of the head and pelvis. It frequently follows surgical operations, especially in large hospitals, and under unfavorable hygienic conditions, where antiseptic precautions are not taken, and especially where large raw surfaces are produced, and where the bladder, prostate, urethra, rectum, and the bones or veins are concerned. It is also common after parturition, from the exposure of the uterine surface with its open veins to septic matter, and it constitutes one of the most common and fatal forms of puerperal fever. In suppurative inflammation of the bones, where the periosteum is detached and necrosis occurs, septic or purulent matter is apt to find access to the veins, and to produce this condition, and in various specific or unhealthy inflammations, as in erysipelas, dissecting wounds, carbuncle, malignant pustule, and low forms of dysentery and other inflammations of the rectum with its abundance of large veins, pyæmia or septicæmia is liable to occur. Previous unhealthy conditions predispose to its idiopathic forms; and contagious influences, and the presence of bacteria, by exciting septic changes, are now regarded as among the most frequent causes of the affection. These may operate on the vigorous as well as the feeble. The condition spoken of as "hospitalism," where large numbers of wounded or puerperal patients are often crowded in small spaces, without proper air, space and ventilation, is connected with and finds its expression in pyæmia; and under such conditions, and sometimes in spacious and well-ventilated institutions, morbid matters as causes are undoubtedly transmitted from person to person. Still, in many instances pyæmia originates *de novo*, especially in internal inflammations and where there is no breach of surface, but where the internal surfaces of veins are concerned, introducing into the blood inflammatory products. In such cases the presence of bacteria, or of specific germinal poisons may not be necessary to the production of this affection.

On *post-mortem* examination the patches of disease already referred to, especially in the lungs, where the blood of the general venous system carrying clots and other morbid matters first comes into capillary vessels, are found in different stages of advancement. They are from the size of a pea to that of a walnut, or larger. These points are sometimes apoplectic—blood effused into cavities—sometimes the blood is injected into the tissue from the rupture of capillary vessels (hemorrhagic infarction), the spots being reddish black, or more or less faded in color; sometimes they present the appearance of lobular pneumonia; sometimes they are partly broken down into a puriform pulp, and at others there are distinct abscesses or gangrenous cavities. They are scattered in different portions of the lungs, but are most abundant at the surface, and there is usually more or less congestion and œdema of the general lung tissue, and occasionally decided pneumonic consolidation. When these diseased spots come to the surface, the pleura covering them will be found congested and inflamed, and an effusion of lymph to a greater or less extent is generally observed, and sometimes general pleurisy ensues. Subpleural petechiæ are common; and the surface of the heart, as well as the lungs, often presents points of extravasations of blood; and evidences of pericarditis and endocarditis are not unfrequently found. The liver, spleen, and kidneys are also often found affected in a similar manner to the lungs, the patches varying in size and particular appearances in consequence of the different structure of these organs. Small abscesses are common in the cortex of the kidneys; and in other cases less advanced there are congestive spots, with intervening portions anæmic and paler than normal. The brain is not as commonly affected with pyæmic changes, but they are not unfrequently found, though the extravasations are small in amount, and generally limited to the surface; but patches of softening, like those found from embolism, but small in size, may occur in any part of the brain, and abscesses of a larger size may also be found. The meninges may be inflamed; and the peritoneum and intestinal walls are sometimes affected like the pleura. The bones and joints are not unfrequently affected by the same general cause; and the connective tissue and the muscles, the eye, the prostate, and the testes have also been found involved. The skin is sometimes moderately jaundiced, and occasionally presents petechiæ; and from the free sweating sudamina are common.

As pyæmia or septicæmia is a blood poison, the conditions of the blood and of the vessels containing it are subjects of much interest. The general mass of the blood, and the greater part of the vessels, present no unusual appearances. Occasionally a small mass of disintegrated fibrine with some purulent corpuscles embedded in it has been found. The minute arteries leading to and distributed in the secondary patches already described, and the veins involved in the primary lesion which has given rise to the mischief, are found in a morbid state. These small arteries are always found filled and obstructed with coagula or ordinary thrombi, or with disintegrated fibrine and corpuscles, mingled in some cases with what appear to be groups of pus cells.

The veins of the parts which have been involved in the primary inflammation are generally found perceptibly diseased. Their parietes are thickened and indurated, and sometimes perforated by an ulcerative or some destructive process; and the interior is occupied by coagula, which are generally adherent and partially decolorized, and may be solid throughout, though generally the centre consists of a reddish or yellowish purulent pulp or fluid. A minute examination shows this material to consist of disintegrated fibrine, or in some cases true pus. Between this and the venous walls is generally a layer of fibrine, and often a kind of diaphragm extends across the vein, shutting it off from the rest of the vessel. In other cases this septum is wanting, and there is no impediment to prevent the free admixture of this broken-down fibrine and pus with the general circulation.

It was formerly supposed that the secondary abscesses were mere passive deposits of pus, which had found its way from the primary seat of inflammation into the blood, and had been carried by it to parts where it was discovered. Pus, however, is not found to circulate in the blood in sufficient quantities to account for the abscesses in this way, and the theory of embolism now prevails. The diseased veins induce coagulation of blood, and send forth mingled fibrine and inflammatory corpuscles, which pass on through the heart and ultimately plug up the small arteries, exciting irritation and secondary inflammation, which result in the changes—the congestions, infarctions, suppurations, and gangrenes—observed.

While this embolism may account for the local conditions, it will scarcely do so for the phenomena of the pyæmic fever. A more subtle poisonous agent, a septic material, producing other changes in the blood and impressing the nerves and other tissues, is doubtless formed at the original seat of disease, and is absorbed into the blood, and probably into the lymphatic vessels as well. According to Virchow, pyæmia is a twofold disease, embracing the phenomena due to embolism and those due to a more subtle poison. He thinks they may exist independent of each other, and to the latter group of phenomena he applies the term "Septicæmia." This view seems confirmed by what he alleged to be the fact, that patients die with symptoms of pyæmia or septicæmia, when no evidences of embolism can be found—nothing being observed *post mortem* but congestions of some internal organs, and some slight extravasations of blood beneath serous surfaces, and a marked tendency to rapid decomposition. Bacteria are found in the blood of such subjects, and though found in others where no pyæmic symptoms occur, yet they are believed to have much to do in the production of this form of disease.

From all the facts at present known, pyæmia, or septicæmia, is produced by the passage into the blood, through diseased vessels, veins, and probably lymphatics, of morbid and usually septic products, partly solid and partly fluid, having special properties derived from the local disease where they originate. The presence of these matters usually causes more or less coagulation of blood and obstruction of certain small arteries, inducing the local lesions in the lungs and elsewhere so commonly observed, and at the same time specific poisonous properties are communicated to the blood, and morbid impressions are made upon the nervous and other tissues, inducing the characteristic form of fever called pyæmic, or, more properly, septicæmic. M. Guérin suggests the term Pyohæmia, and contends for the superiority of the doctrine of miasms and ferment organisms as the cause of the affection; and states that the discovery by Pasteur of the figure of 8 microbion in the blood tends to sustain the strictly septic theory.

The symptoms and progress of this affection have already been briefly sketched as it occurs in its ordinary acute and rapid form.

There are, however, different degrees of severity, depending, no doubt, upon the different amounts of the poison absorbed, and the different degrees of virulence of that poison; and the effects are more or less modified by the different degrees of susceptibility and power of endurance of the system.

From the local lesions various symptoms arise. From those of the lungs, pain, cough, dyspnœa, sometimes expectoration, and certain physical signs are produced. From those of the liver, pain, tenderness, often a moderate jaundiced condition, etc.

From those of the stomach and bowels, nausea, vomiting, and often, especially in septicæmic cases, diarrhœa, are induced. The lesions of other parts may present their appropriate symptoms. The characteristic mingling of chills, fever, and sweats may take on more or less active forms, sometimes becoming subacute or even chronic, and assuming the character of hectic fever. Abscesses may form about the joints or elsewhere, and the patients may struggle through or succumb to a longer course of this irritating and debilitating disease. In the acute cases the rigors may possibly be absent, though commonly present and characteristic, and they vary in frequency and continuance, are sometimes repeated at short intervals, and at others only once or twice a day, and often cease after the first few days. The accompanying fever fluctuates, often with great rapidity, the temperature speedily rising to 104° or 107°, or even more, and occasionally falling to a little above the normal. In other cases the temperature varies but little, maintaining a constant high standard. Death may be preceded by a condition of collapse, with low temperature, or the temperature may continue high; and sweating, which has alternated with dryness of the skin throughout the progress of the case, usually attends, in a colliquative form, the last stage. The respiration is commonly rapid, independent of the local lesion of the lungs, often reaching from forty to sixty in the minute.

The feebleness of the pulse is a marked condition, and its rapidity, especially on exertion, is generally great. As the disease progresses it often rises to one hundred and forty or one hundred and sixty per minute, and may become almost too fast to be counted.

The jaundiced condition, so often present, does not always depend upon the pyæmic deposits in the liver, but, as observed by Frerich, whose authority is so high upon every subject pertaining to the liver, "the jaundice here appears to be the result of an impaired consumption of bile in the blood, arising from an abnormal condition of the metamorphic processes which go on in that fluid."

As destructive metamorphosis proceeds rapidly, urea is largely increased, and the urine sometimes contains a small quantity of albumen.

The nervous symptoms are similar to those observed in typhus and other specific fevers, and need not be specially enumerated.

Prognosis.—The prognosis, as already intimated, is exceedingly unfavorable; though recovery sometimes takes place after the occurrence of very severe symptoms; and of course more frequently where the symptoms are mild.

Diagnosis.—The diagnosis is not difficult where the disease occurs in connection with injuries, surgical operations, or the puerperal state. When it occurs in connection with erysipelas, carbuncle, dysentery, internal inflammations and suppurations, where its symptoms resemble and are mingled with those proper to these diseased conditions, there may be more difficulty in distinguishing it.

The special diseases for which pyæmia is more likely to be mistaken are, typhus, typhoid, and severe malarial fevers ; internal acute inflammations of the lungs, liver, and urinary organs; and acute rheumatism. A careful comparison of phenomena will in many cases be required. When pyæmia is suspected, a careful local examination for the discovery of some point of suppuration should be made.

Treatment.—Unfortunately medicines have but little control over the established and more severe cases of pyæmia, and hence its prophylactic management becomes the more important. In surgical and obstetrical practice, especially in hospitals, preventive measures are of the utmost importance. Though the condition often occurs spontaneously from the absorption of morbid inflammatory matters, yet when pyæmia or erysipelas, however originating, appears among numbers of patients, there is a remarkable tendency to its spread, and great pains should be taken to prevent that result.

Isolation, cleanliness, ventilation, disinfection, extra care not to allow matters to be conveyed from one patient to another, are essential. The great benefit of Lister's method is now generally acknowledged.

Great care in the management of the original seat of the disease leading to pyæmia will be important. Collections of matter should, if possible, be evacuated, foul abscesses cleansed, antiseptic injections and washes often used, and every possible means employed to prevent absorption of septic matters.

The indications for curative treatment are to eliminate the morbid matters from the blood and system ; to prevent septic changes there, and, if this be impracticable, to palliate the symptoms, and enable the patient to endure the disease.

The free sweating so likely to occur, while it suggests the possibility of the elimination of poisonous materials by the skin, seems to supersede the necessity of diaphoretics ; and the frequent occurrence of diarrhœa affords similar suggestions in regard to the bowels and the use of cathartics. But when the skin and bowels are not active, eliminative diaphoretics and cathartics, as the strength will bear, would seem to be indicated, with the hope of relieving the blood of some of its poisonous elements.

The kidneys also might be gently excited to an increase of their function. For the prevention of septic changes, various antiseptic agents have been recommended. Among these the sulphites have most reputation, or at least have been most strongly recommended, particularly by Prof. Polli, of Milan. They have often been tried, but generally have failed to arrest the disease or save the life of the patient.

Quinine as an antiseptic and an antipyretic agent has been suggested and tried, and is the agent most relied upon, and most frequently given. It may be given in antipyretic doses when the fever is high, and in smaller doses when its tonic and sustaining effects are required. It perhaps affords as much prospect of beneficial results as any other agent; but it, too, has generally been found unavailing. The tinct. of iron has had no better results, and, in fact, all curative treatment has been exceedingly unsatisfactory. The special symptoms that may arise during the progress of a case may be palliated, especially may anodynes be given to relieve pain and procure rest, and these, with other soothing and sustaining measures, such as the particular pathological conditions and the symptoms suggest, may be of service not only in diminishing suffering, but possibly, in some cases, in enabling the patient to survive the disease.

Attention to all hygienic measures will, of course, be required, and the most easily digested and nourishing food should be given in as free quantities as the stomach can bear and the system appropriate. In the great depression which is a characteristic of the disease, alcoholics are generally advised and given. Their efficacy as sustaining agents is doubtful; and I fully agree with the opinion of Dr. Bristowe, as expressed in his article on this subject in Reynolds' System of Medicine, that the practice of "pouring in," as it is called, lately fashionable with some practitioners, should be condemned.

Occasionally, though very rarely, pyæmic symptoms occur, with the circumscribed spots in the lungs and elsewhere, not only without any external wound but without any primary suppuration in any part of the body. This may arise from morbid changes in the blood—large numbers of leucocytes being produced, and other materials causing emboli, infarction, suppuration, etc. A few such cases I have seen; one in which the characteristic conditions were found in the lungs post mortem, but where a diligent search failed to discover any more primary inflammation. The treatment in such cases will not materially vary from that of other cases where there is the more common primary suppurative condition.

Some years ago Mr. James Paget (now Sir James), called the attention of the profession to a form of pyæmic blood poisoning less violent in its symptoms and less rapid in its course than the ordinary forms of the disease which have been described. There are, however, collections of pus in the acute cases, often widely dispersed, and those conditions are often accompanied by rigors, profuse sweating, inflammation of veins and joints. It extends, with abatements and relapses, for many weeks or months, and at length becomes so mild as to affect the health but little, and scarcely at all threatens life. The local evidences of this state are more common in the limbs than in internal organs, but they are not uncommon in the veins in the later stages of the disease.

A somewhat similar condition occurs in some cases after fevers, and is spoken of as the "relic" of the fever. In some cases no local lesion producing suppuration as a primary state is found, and in these, as well as in the acute cases, leucocytes are multiplied in the blood, and may there be transformed into pus, and deposited with results not as severe and fatal as in the ordinary forms of the disease, but still often producing serious consequences.

Glanders and hydrophobia, syphilis and gonorrhœa, are placed by some authors among the specific infectious fevers, but as they are treated of in works on surgery they are omitted here. Dysentery, though in some of its forms it is a specific fever, at other times is a local affection, and as its chief phenomena are local, it will be dealt with in connection with other intestinal diseases.

Elephantiasis Græcorum is placed by Bristowe among the affections we have been considering, but as it has been placed among cutaneous diseases, and is treated of in surgical works, it will be omitted in this place.

Before treating of diseases of particular organs and systems, there are several other general affections involving the whole organism, but not coming under the head of infectious fevers, or at least being different in many of their features from those which have been discussed, and these will now claim attention. They are produced not by poisonous material taken in from without, but by conditions existing within the body.

SCORBUTUS.—SCURVY.

This is a condition of general malnutrition, produced by deficient or improper alimentation, especially by the absence of fresh vegetables and organic acids in the food. The disease is marked by a dull leaden pallor of the skin ; great bodily and mental weakness ; difficulty of breathing on even slight exertion, without physical signs to account for it ; oozing of a bloody fluid into various tissues, presenting petechiæ and ecchymosed-looking spots upon the skin ; generally a spongy, swollen, and livid state of the gums, with a disposition to bleed on the slightest irritation, and often with an offensive odor of the breath.

This disease is progressive, and tends to a slowly fatal result when the causes which produce it are continued; and in its less fully developed forms it modifies other diseases with which the patient may be affected, particularly fevers and affections of the bowels. It was formerly very frequent on shipboard on long voyages, and has been a severe scourge to many armies.

Deficiency of food of any kind will result in imperfect nutrition and debility, but the peculiar phenomena of scurvy do not appear when the supply of fresh vegetables has been sufficient, whatever other privations may exist, though the simultaneous deficiency of other articles of food, especially of fresh meat, aggravates the conditions. It was formerly supposed to be produced by the direct effect of a salt-meat diet, and though the disease is more speedily and severely developed when persons are confined to such articles of diet, yet it has frequently appeared when fresh meat was used, but when fresh vegetables were not provided. When salted meat appears to produce or aggravate scurvy, it is rather from the deficient nutriment in the meat than from any positive effect of that kind of food; as persons have often been known to have the disease who for many weeks before had lived on tea and bread and butter.

It is asserted by Dr. Buzzard, that "there is no case on record of scurvy occurring in a person who has been adequately supplied with fresh succulent vegetables of good quality; and that persons living upon salt meat may be prevented from having the scurvy by the regular administration of fresh vegetables or the juice of lemons."

The causes of scurvy are well defined, and admit of no doubt. The leading phenomena have been briefly stated. More or less variation, however, occurs in different cases in the symptoms and course of the disease. Among the earliest symptoms are a pale, sallow, or greenish tint of the skin, an aversion to exertion, and a listlessness of mind, an indifference to health as well as to other things. There are likely to be pains about the limbs and back, but the appetite may still remain good, though the bowels are apt to be constipated. There is no fever; and sleep, though sometimes dreamy, is not interrupted. Gradually petechiæ make their appearance, usually first upon the legs and thighs, in small reddish-brown points, which in time run together and form irregular bruised-looking patches, but not elevated above the level of the skin. In some cases the eyes and their surroundings are at this stage the only parts which present marked evidence of the disease. The integument of the lids and parts about may be puffed up into a bruised-looking swelling, and the sclerotic coat may present a swollen condition with brilliant redness, but without pain or a discharge. A puffy swelling, deeper than the skin, especially about the popliteal spaces and corresponding parts about the elbows, often occurs. Sooner or later, and often at the same time with the early appearance of other phenomena, the gums are changed—sometimes at first becoming pale and contracted, they are afterward swollen and encroach upon the teeth, presenting a livid, spongy, and hemorrhagic appearance. They are not tender to the touch, but bleed—generally slightly, but sometimes freely—on being irritated. The teeth are likely to be loosened and may drop out; and, in severe and protracted cases, there is a tendency to superficial ulcerations and sloughings from slight injuries of the surface, especially where the puffy swellings are situated.

The anæmia progresses, the heart becomes weak, dyspnœa on the slightest exertion is great, and fits of syncope may come on with danger to life. In the latter stages of the disease the appetite is apt to fail, diarrhœa to come on, with offensive bloody stools, disturbance of vision, ringing in the ears, vertigo, want of sleep, and rarely delirium.

In some cases thoracic complications arise, such as congestion of the lungs, with hemorrhages into their substance, effusions into the pleura, bronchial congestions, bloody expectorations, often with an offensive gangrenous odor. The duration is uncertain, but it may extend over many weeks, or even months. Death is usually due to failure of the heart's action, either by syncope or asthenia, and may be hastened by the occurrence of hemorrhage.

Morbid Anatomy.—*Post mortem* there is a tendency to rapid decomposition; and extravasations of blood and other exudates from it are found not only in external parts but in internal organs, in the lung substance, beneath the pleura, in the walls of the heart, and under the pericardium, in the intestinal parietes, and beneath the peritoneum; and bloody effusions are often observed in the serous cavities. The swellings, particularly about the joints, are not entirely produced by the effusions of blood, but are found to consist of fibrinous exudates, which become consolidated into more or less plastic material. The blood contains an excess of fibrine, but a deficiency in the number of red corpuscles, and is of abnormally low specific gravity.

Diagnosis.—The diagnosis in the prevailing disease as on shipboard, among illy fed troops, etc., is not difficult. In isolated cases and in the early stage, and even in advanced conditions, it may not be readily recognized. Where there is any suspicion of the disease, inquiry into the diet should be minutely made; and with this aid, a careful observation of the symptoms described can scarcely fail to result in correct conclusions.

There has been much speculation as to the special elements in fresh vegetables, the absence of which results in scurvy; and also as to the intimate changes which take place in the blood and tissues in this disease which are the immediate causes of the phenomena. No satisfactory conclusions have been arrived at, and we need not be detained by an account of the theories which have been suggested. It is true that the blood is found specifically lighter than normal, and this would increase the tendency to exosmosis into the tissues; but this fact fails to account for the other pathological conditions observed.

Treatment.—The essential treatment of scurvy, both prophylactic and curative, consists in the use of fresh vegetables and fruits as a part of the dietary, and in their absence, of fresh lemon juice, or of pure lemon juice so prepared and preserved as to retain its natural properties. Other easily assimilated and nourishing food is also important, but nothing will avail in restoring health without a supply of these needed ingredients. Potatoes, onions, carrots, turnips, cabbage, celery, cresses, lemons, oranges, limes, grapes, apples—all green vegetables and fruits, are useful, but lemons and lime juice are found to be more easily assimilated, and more speedy in effects than other substances. The presence of diarrhœa affords no objection to the use of properly prepared vegetables, and particularly none to lemonade and other forms of citric acid.

In addition, particular symptoms may require palliation by other and more strictly medicinal means. The diarrhœa, if severe and persistent, may be checked with nitrate of bismuth, turpentine emulsion, or other astringent and soothing medicines. The gums, when bleeding, may be brushed over with nitrate of silver, with washes of chloride of zinc, used with care and of the proper strength; and for the offensive fetor of the breath, chlorine solutions, Condy's fluid freely diluted, or other antiseptic washes may be used.

When effusions take place into the cavities, iodide of potassium will be found useful in promoting absorption; and tonics may be required in cases of great debility. The specific antiscorbutics must be persisted in, however, and with these and the other obviously indicated palliative measures, great success generally results.

In advanced cases care should be taken to prevent overexertion and syncope.

Particular rules for preparing and issuing antiscorbutics on shipboard are given, which it is unnecessary here to specify in detail.

The influence that the scorbutic state, even in its incipient conditions, has upon other diseases is important. Fevers occurring in such subjects assume a lower and more adynamic form, and diseases of the intestines, such as diarrhœa and dysentery, are more obstinate and protracted, and tend to the production of ulcerative processes. In the treatment of such diseases, in addition to the measures usually required for them, succulent fruits, lemon juice, etc., must be given as they can be borne.

PURPURA.

Purpura is a term applied to extravasations of blood or its coloring matter into the skin, presenting purple-colored spots of various sizes and forms; and in many cases, at the same time, similar extravasations occur in deeper tissues and in internal organs. In this sense it is a symptom which may occur in connection with various diseases or pathological states, where either the vessels are so diseased and weakened, or the blood is so changed in its character or its pressure as to escape from its vessels into tissues, particularly the tissues of the skin. It sometimes thus occurs as a symptom of low fevers, constituting the petechiæ, vibices, etc., mentioned in various diseases already described.

It is not uncommon, as we have seen, in scurvy, small-pox, measles, typhus, and occasionally in malarial fevers; and it is also met with in scarlatina, diphtheria, and pyæmia, and, as we shall see, in some liver diseases, in obstructive heart disease, and in embolism.

Sometimes this purpuric condition occurs without being a symptom of, or associated with, any other disease, and is the only pathological phenomenon recognized. It must, in such cases, be regarded as an idiopathic affection, and as such has a series of phenomena and a history, not always the same, but sufficiently distinctive to entitle it to a separate consideration.

The *causes* of this distinctive affection are exceedingly obscure. It occurs at all ages and in both sexes, but is perhaps more frequent in children than in adults. It is more frequent in feeble, ill-conditioned persons under unfavorable hygienic circumstances, but it is also met with in vigorous and healthy-looking individuals under favorable hygienic conditions. It sometimes returns periodically, at intervals of three, six, or more months.

The symptoms and progress vary in different cases. Sometimes it is preceded by vague premonitory symptoms, by lassitude, general pains, loss of appetite, etc., lasting for one, two, three, or even four weeks. At other times the attack is abrupt, in the midst of apparent health. The skin becomes studded more or less thickly with small, circular, dark red, or purple, almost black spots, varying in size from a mere point to two or three lines in diameter. They are not raised above the level of the skin, are not accompanied by pain or other morbid sensations, and do not disappear on pressure. They are usually most abundant on the lower part of the trunk and the lower limbs, but appear on other parts as well; and not unfrequently extravasations occur in the loose texture about the eyelids, under the conjunctivæ, and under the mucous membrane of the mouth, tongue, lips, gums, etc. Appearing in moderate-sized rounded forms, the spots are called *petechiæ;* when in longer stripes, as sometimes happens, they are called *vibices;* and in larger patches, *ecchymoses;* while, when they occur in mere points, they are called *stigmata.* These spots consisting, like the discolorations after bruises, of blood out of the vessels, in the tissues, undergo the same changes of color as these latter ecchymoses, often turning greenish and then fading and disappearing. New crops, however, appear from time to time, and thus the symptom is continued for two, three, or four weeks, or even longer. The larger extravasations are generally deeper than the skin, and attended with some degree of swelling. They may be so deep as not to discolor the skin at first, but may reveal themselves by the altered colors coming to the surface. Some slight mechanical violence may be concerned in their production, or they may occur without such cause. In all these cases there is more or less tendency to hemorrhage from mucous surfaces, from the nose, gums, stomach, intestines, lungs, and kidneys, bladder, uterus, and vagina. In some cases the hemorrhage is slight, while in others it is profuse and repeated.

In the slighter cases the general health may not be seriously affected, but in those more severe, the general symptoms mentioned as ushering in some cases continue; and when the more severe hemorrhages occur, anæmia, depression, and debility will of course follow. The pulse becomes jerking, noises are heard in the ears, the vision is indistinct, motes float before the eyes, headache, restlessness, delirium, mania, or convulsions and death, in severe cases may occur. As the immediate cause of death is usually the loss of blood, the mode is by syncope or asthenia. Before death the temperature may be either increased or diminished from the normal. To the milder forms, with little or no hemorrhage, the term *purpura simplex* is applied—to the more severe, *purpura hemorrhagica,* where bleeding occurs from the mucous surfaces, or where the effusions in the skin and subcutaneous tissues are more extensive.

Purpura urticans and purpura senilis are still other varieties, where in the one case a burning irritation is felt with an inflammatory blush, and in the other the disease occurs as a consequence of old age.

On *post-mortem* examination very little is discovered which throws light upon the nature of the disease. Hemorrhagic effusions are found not only in the skin and subcutaneous tissue, but under mucous and serous membranes, and, more rarely, in the substance of organs. Fatty degeneration of the heart and other parts have been found in protracted cases where hemorrhages had repeatedly occurred.

The blood was found by Dr. Parkes, in a few cases, to contain an excess of iron and a diminution of solid constituents; but whether these conditions are so constantly present as to constitute a necessary feature of the disease, has not been proven.

A similarity will be noticed between some of the phenomena of scurvy and purpura, but the latter is not dependent upon the same cause as the former, and is not cured by the use of fresh vegetables or lemon juice. There must, therefore, be a difference in these diseases, though the hemorrhagic phenomena are similar. Some have thought that purpura depended upon an altered condition of the blood, while others have regarded the vessels as chiefly in fault. In support of the first view is the fact that the injection of putrid matter into the veins of animals will cause ecchymoses in various situations, and the injection of ammonia will cause hemorrhages. It has been suggested that changes in the conditions of the blood may produce an abnormal attraction between the blood and the walls of the vessels, causing obstruction in the capillaries and their rupture. The presence of a free quantity of bile in the blood is said to dissolve the walls of the blood discs, leaving the hæmatine free to ooze out into the tissues. But in purpura there is an escape of the blood discs, and though in inflammation some few red discs pass through the coats of the vessels, yet they cannot be supposed to pass out in such quantities as is the case in purpura, without a material change in the vessels themselves. A lardaceous degeneration of vessels has been found in some cases, but it has not been proven that such change is present in all cases; and the exact pathology of the disease remains to be established. Rupture of capillary vessels must be assumed; but whether such rupture is produced by some primary change in the blood acting upon the vessels, or whether the primary change is in the tissues of the vessels, has not been determined.

Treatment.—In the absence of satisfactory knowledge of the pathology of purpura, its treatment has been empirical rather than founded on well-established rational principles. Regard should be paid to the tendencies of the patient and to his previous habits and conditions. All complicating affections must receive such attention as may be required. The remedies in cases of idiopathic purpura which have most testimony in their favor are cathartics, quinine, sulphuric acid, the astringent preparations of iron, and the oil of turpentine. In the more sthenic forms, with cardiac and vascular excitement and elevated temperature, cathartics, such as a mercurial followed by sulph. soda or magnesia in a solution acidulated with sulph. acid, are apparently useful. Laxative doses may be repeated as occasion shall require, if they seem to be well borne. The value of quinine and tinct. of iron in tonic doses, the iron, especially, in free doses, seems to have been attested by experience. There is much testimony in favor of the oil of turpentine. This article may be given in the form of an emulsion, in doses of from fifteen or twenty drops up to a drachm or more, repeated a few times a day for some time. It seems to tone up the vessels concerned, and the system at large, and tends to the prevention and arrest of the hemorrhage. Should the loss of blood be considerable, ergot and gallic acid should be tried in appropriate doses. When bleeding occurs from parts that may be reached by local means, these should be made use of. The tincture of larch bark in doses of ten or fifteen drops, repeated every hour, is reported to have exerted a decidedly beneficial influence.

In a majority of idiopathic cases recovery takes place in a few weeks. Some are fatal within a few days, with high fever and typhoid symptoms. In such the quinine as an antipyretic is worthy of a trial. When death occurs at later periods, it is usually from repeated attacks of hemorrhage; and for such cases every means, general and local, should be resorted to for the purpose of arresting the flow of blood. Here the ergot and astringents should be faithfully used. The claims of oil of turpentine as an astringent and stimulant should not be overlooked. Pretty free doses are generally required. As symptomatic of low forms of fever and other diseases, purpuric conditions are of grave import. They generally indicate a low state of the system, requiring tonic and supporting measures.

Hæmatophilia and Hæmophilia are terms which designate a condition in which there is a congenital hemorrhagic tendency. The diathesis is generally not manifested in early infancy, though fatal umbilical hemorrhages in new-born children are attributed to it; but during the first and second year it becomes more marked, though occasionally its manifestation is delayed until a much later period. It is most marked in the comparatively earlier periods of life, and diminishes with the advance of years.

In these cases of the innate hemorrhagic diathesis, there is a continued oozing of blood following slight wounds, minute punctures, vaccination, superficial abrasion of the skin or mucous surface, and these bleedings are arrested with great difficulty. There is far less tendency to extraordinary hemorrhages from deep incised wounds than from these slight and superficial ones, so that the bleeding from a slight wound has been arrested by converting it into one deeper and of larger dimensions. But deep wounds, as from surgical operations, are liable to be followed by secondary hemorrhages which may prove serious. Spontaneous hemorrhages are liable to occur from every mucous surface of the body of one affected with this diathesis, and in females, menorrhagia is a common occurrence. Bleedings are reported to have taken place even from the ears and skin, without any appearance of abrasion. Extravasations of blood are liable to occur from slight injuries, and a bruise to be followed by a bloody tumor in the part.

This peculiar diathesis in many cases is inherited—"running in families." The majority of those afflicted are males; and though diminished sooner, it is seldom extinguished before the age of forty.

The pathology of this state is unknown. It was formerly supposed that there was a want of coagulability in the blood from a deficiency of fibrine, and that it was thus deprived of one of the ordinary means of arresting its flow; but this seems to have been disproved. We are therefore left to the conclusion that the diathesis depends upon some peculiar condition of the smaller blood-vessels, in which they fail to contract when severed, or at least fail to conduct themselves as in ordinary cases. The causes which result in this state of things are entirely beyond our knowledge, and we can only refer them to the mysteries of heredity and of original formations. We know of no means for the extinction of the diathesis but the celibacy of those affected with it.

Treatment.—No treatment is known to have any effect upon the tendency, beyond that of keeping the system in good hygienic conditions, and removing any other diseases which may occur. When hemorrhage takes place all surgical means, as the use of styptics, cold, pressure, etc., are indicated, and internally the astringent preparations of iron, gallic acid, ergot, etc., may be tried. The douche, by numerous jets of cold water applied with force to the lower extremities, has been particularly recommended. When so much blood has been lost as to result in anæmia, the use of iron and other measures for remedying that condition is indicated.

LEUCOCYTHÆMIA.—LEUKÆMIA.

This is a morbid condition of the general system, progressive in character, and very commonly, if not always, fatal in results; characterized by a marked and persistent increase in the number of white corpuscles in the blood, by diminution of the red discs, and by enlargement and other changes in the spleen, liver, and lymphatic glands of the intestines and of other parts.

The number of white corpuscles in proportion to the red in the physiological state is variously estimated as one of the former to from 355 to 335 of the latter. The proportion of white corpuscles is often physiologically increased above this, temporarily, as after full meals and in pregnancy; and it is also increased pathologically for a time in inflammation and fevers; but in leucocythæmia the increase of the white corpuscles is much greater than occurs in the physiological state or in these other pathological conditions; and instead of being temporary the change is permanent and progressive.

The temporary increase of the white corpuscles as a symptomatic event in inflammation, fever, etc., is called *Leucocytosis;* while *Leucocythæmia* indicates the greater, the more idiopathic, and the more permanent change.

It is now generally believed, though demonstration is perhaps wanting, that the white corpuscles are produced in the spleen, the lymphatic glands, and the liver; and that the red discs are produced from a farther change of the white globules. In leucocythæmia there is thought by some to be an increase in the activity of the organs producing these white corpuscles—at least there appears to be a hyperplasia of these white floating cells; but it is possible that the increased number of them in the blood is due to the arrest of their transformation into red discs. This latter view seems to me probable, as the morbid condition of the blood-producing organs found to exist in advanced stages of the disease, when the proportion of white corpuscles is greatest, would seem to indicate imperfection and diminution, rather than increase in their action.

It is quite possible that in the early stages of the disease, when the blood-producing glands are excited and increased in their proper tissue, more than the normal quantity of white corpuscles is manufactured, and that at a later period there is failure in their transformation. Whichever view may be taken of these questions—and they are matters of theory and belief, rather than of knowledge and demonstration—a very large proportion of white corpuscles is present, accompanied with marked diminution of the red discs; and this state of things is accompanied and followed by very serious consequences.

In the phenomena observed clinically, the first that may be noticed is an enlargement of the spleen or lymphatic glands, or both ; but soon, and sometimes before such changes are observed, there begins to be failure in the general vigor of the system, going on to more positive debility, anæmia, pallor, emaciation, and a cachectic state, with discoloration of the mucous membrane, palpitation, cephalalgia, dyspnœa on slight exertion, occasional feverishness which later becomes more permanent and hectical ; sometimes constipation and at others diarrhœa. These symptoms gradually augment, and continue from a few months to three or four years, averaging about fourteen months, until at length a pneumonia, a hemorrhage—not unfrequently cerebral—an exhausting diarrhœa, an asphyxiated state, or a failure of the heart's action closes the scene. There may be temporary improvement, but a fatal result is said uniformly to follow.

The etiology of this affection is obscure. It is rather more frequent in men than women, and in a large proportion of cases occurs in adult life.

Although cachexias presenting in some respects similar phenomena occur in other conditions, as from malaria, scrofula, and syphilis, yet this differs from all other diseases, standing by itself as a peculiar affection.

Diagnosis.—Its diagnosis cannot be determined by any one external symptom, nor with certainty by all of them together—the examination of the blood by the microscope and the detection of the large numbers of white corpuscles being the only test of the existence of the disease.

In order that it may be conclusive, and the degree of progress may be observed, repeated examinations should be made, a drop of blood from a prick of a finger being taken from time to time. When repeated examinations show the proportion of white and red corpuscles to be as one to fifteen or twenty, the diagnosis may be established ; but as the disease advances, one to four, three, or two, and in rare cases an even number of white and red may be found.

Morbid Anatomy.—The morbid anatomy of leucocythæmia has been studied with much care. The most notable changes in the solid organs are found in the spleen, the liver, and the lymphatic glands.

The spleen, involved in four fifths of the cases in the early stages of the disease, is enlarged by hyperplasia of its proper tissue, but later it undergoes degenerative changes. The capsule is generally thickened and hardened, and the connective tissue is proliferated ; and when death occurs in the advanced stages, hemorrhagic infarction not uncommon.

In two thirds of the cases the lymphatic glands are affected, ar in essentially the same manner as the spleen. There is hyperplasia the gland tissue, increase of connective tissue, thickening and har ening of the investing capsule, etc.

The liver is usually found somewhat enlarged, but not quite often or to as great extent as the spleen.

The lesion extends over a considerable number of the lymphat glands—by preference those of the neck, axilla, groin, mesentery, ar the bronchial group. Sometimes the enlargement is confined to part of the glands, sometimes it extends to many. The spleen may l enlarged without the glands, or the glands without the spleen, or a may be affected at the same time. All these changes are of much tl same character. There is multiplication of the cells, nuclei, ar granulations, and sometimes cheesy metamorphoses.

The intestinal glands are sometimes, but not so often, affected l hypoplastic swelling.

Changes are also found outside of the system of the blood gland as in the pleura, pericardium, and other parts. The new formatio are composed of free nuclei, small cells filled with nuclei, etc., su rounded by a thin membrane and detached from surrounding tissue These products in the liver seem to come from the walls of the bloo vessels and the bile ducts; and in the pleura and intestines from tl connective-tissue corpuscles; but cellular emigration forms a part the adventitious products. The choroid coat of the eye and the bra may be the seat of these changes. The hemorrhages that occur the brain and other viscera are produced by the obstruction of son branches of vessels from accumulation of leucocytes, the blood fro this cause being forced into the collateral branches and rupturir them.

The blood, as already stated, when examined during life, is four to contain an enormous proportion of white corpuscles. The same observed after death. These white elements, however, vary in diffe ent forms of the disease. When the spleen is the seat of the greate change, the cells are perfect, with one or a few small nuclei. Whe the chief lesion is in the lymphatic ganglia, or the glands of the ir testines, free nuclei are numerous, and there are many more cells small size. These modifications constitute two varieties of leucoc thæmia—splenic, and ganglionic or intestinal.

The discovery has lately been made that in some cases, as aft amputation, the marrow of the bones contains white corpuscles great abundance, and in some instances they are supposed to ha been seen in stages of transition into red corpuscles. Hence, the inference has been that the marrow of the bones is one source of the production of blood corpuscles.

Jaccoud expresses the opinion that in morbid conditions of the marrow of the bones we have another source of the abnormal amount of white corpuscles in this disease.

The blood taken from the veins of the cadaver of one dying of this disease, presents a layer of grayish-yellow color formed by an accumulation of white elements of the blood. Often in a defibrinated portion of blood there is a superficial layer, milky in color, entirely composed of white globules. The serum is clear and limpid. In the clots in the right side of the heart and large vessels, there are whitish points looking like pus, especially in the pulmonary arteries. There is twice as much of this matter in the spleen as in the jugular veins. By a careful examination it will be found that from five to fifteen per cent. of these white globules have undergone fatty degeneration. The blood is diminished in density, but the albumen, salts, and fibrine have undergone no constant changes. With the increase of the white corpuscles the red discs are diminished, so that the cell elements on the whole are below the physiological average. The blood resembles the splenic liquid, and is found to contain sarcodine, lactic acid, formic acid, acetic acid, leucin, and tyrosin, and it has an acid reaction.

From the diminution of red discs, there is a deficiency of oxidation and of oxygen carriers; and the sense of dyspnœa which occurs, arises in most instances from the want of oxygen in the tissues. Enlargement of the bronchial glands sometimes mechanically interferes with respiration and produces the same result. While there is constant dyspnœa on exertion, more severe paroxysms from pressure upon the nerves of respiration by enlarged glands sometimes take place. There may be difficulty or loss of the power of swallowing and of speech, from the pressure of enlarged bronchial and cervical glands, as from tumors in the chest and neck.

In the urine the urea is deficient, but uric acid and the urates are abundant—the natural results of diminished oxidation. Sarcosin and hippuric acid are generally present.

Treatment.—The treatment of leucocythæmia is exceedingly unsatisfactory. Iron, quinine, and the iodine preparations would seem to be rationally indicated; but though they may abate some of the conditions, they fail to cure the disease. In cases where the spleen is much enlarged, quinine, to the extent of ʒss, given in divided doses, but so that this quantity is taken in the course of twenty-four hours, and repeated once or twice a week, will, as I have several times witnessed, reduce the size of that organ quite remarkably and produce some general improvement for a time, and may prolong life. The administration of phosphorus has in a few cases been thought to exert a curative effect, but it has failed in others. The injection of ergotine, hypodermically, has diminished notably the enlargement of the spleen and produced temporary improvement in other respects. It is advised that forty grains of ergotine be carefully mixed with thirty minims of glycerine, and enough distilled water to make 120 minims. Fifteen minims contain five grains, which may be injected every second day. Iodide of potassium, in free doses, has also diminished the enlarged spleen.

In one well-marked case that fell under my observation some years ago, with enlarged spleen and where the white corpuscles were very abundant, the ointment of biniodide of mercury was ordered to be applied over the spleen, and rubbed and heated in after the direction of Aitken. Decided salivation was produced, followed by remarkable improvement. Indeed, several months afterward the patient, who came from a distance, was reported by his attending physician to be cured; but he was lost sight of afterward, and the ultimate result of the case was not ascertained. Jaccoud remarks that mercury produces temporary improvement, but that life is rather shortened than prolonged by its use.

HODGKIN'S DISEASE.—LYMPHATIC ANÆMIA.

This is an affection resembling in many of its phenomena leucocythæmia, and by Jaccoud called Pseudo-leukæmia. It has also been called lymphadenoma, and adenia or adenoid disease.

It is characterized by progressive anæmia, and a decided enlargement of lympathic glands, particularly about the neck and chest; and often in points where these glands are not usually seen. The affected glands are apt to be more enlarged than in leucocythæmia, and may be situated in various parts of the body, even in the brain and spinal cord. In some of the cases the spleen is enlarged, and in a smaller number the liver also. Like leucocythæmia, the disease is progressive and ultimately fatal, and its alliance in symptoms and progress to this affection is very marked. It differs from it, however, in the essential fact that the number and proportions of the white corpuscles of the blood are not usually increased, and never to anything like the extent that they are in leukæmia. As in the last-named disease, there may be fever of an intermitting or hectical character as the later stages approach, and hemorrhages are still more apt to occur.

Diagnosis.—The diagnosis is to be made out by the character of the tumors and the general symptoms ; and the disease is distinguished from leucocythæmia by examining the blood. It more frequently occurs in males than females, and I have seen it more frequently in the adolescent or young adult. It may, however, occur at almost any age. The pressure of the enlarged glands often produces symptoms not necessarily belonging to the disease—such as dyspnœa, aphonia, dropsy, etc.

Treatment.—The treatment is essentially the same in its indications and results as in leucocythæmia. In one case of a young man who came under my observation, a profuse hemorrhage from the lungs or stomach, or both (the account given by the friends was not sufficiently clear to determine its source), was followed by great relief of the previous distressing symptoms, and what was more marvelous, by an almost complete removal of the large glandular tumors in a remarkably short time. The friends supposed a cure had been effected, as just before that event there had been a change of physicians, and the new man was thought to have done wonders, and to have produced results different from those predicted ; but severe symptoms in a short time returned, and a fatal result soon followed. In another case, of an elderly woman, the red blood discs presented under the microscope a contracted, shriveled, and irregular appearance.

Sooner or later, as a rule certainly, the termination is unfavorable, though in some cases arsenic is alleged to have had a curative effect.

PERNICIOUS ANÆMIA.

This is a disease where the deficiency of blood, especially of the red discs, is doubtless dependent upon some other pathological state—some defect in the blood glands of the system ; but as this defect has not been distinguished, the anæmia is spoken of as idiopathic. Its determinable pathological state is the anæmic ; and as this is persistent and so commonly results fatally, it is called pernicious, or "idiopathic fatal anæmia." The further term of anæmatosis has been suggested. It differs from simple anæmia in being much more severe in its phenomena and results. 'Its characteristic is slowly progressive impairment of power, until death takes place from failure of the heart's action, in from three months to a year. It resembles in some of its features the diseases last considered, but differs from leucocythæmia in its less marked increase of white corpuscles, and from lymphatic anæmia by the absence of the enlarged glands.

The countenance shows intense anæmia by its excessive paleness or the absence of blood tints, though it is sometimes jaundiced or of a sallow straw-colored hue. An œdematous condition is often present, and in the latter stages general dropsy. The pulse is feeble and accelerated by exertion, and a sense of impending dissolution and fits of syncope are common. The impulse and sounds of the heart show great weakness of the organ, and fatty degeneration of its substance is often found after death. Anæmic murmurs are of course marked. Hemorrhages, petechiæ, ecchymoses in the retina, cerebral effusions of blood, with their consequences, are frequent. There is dyspnœa, palpitation, often loss of appetite, but still the body is not greatly emaciated, and the mind is generally intact, at least until a late stage of the disease. Fever often occurs in irregular paroxysms, the temperature rising from 101° to 104°, as in the other allied affections. While leucocythæmia oftener appears in men, this disease is more common in women, and not unfrequently is developed during pregnancy.

Diagnosis.—It is distinguished from simple anæmia by its progressive character and greater gravity; from diseases of the kidneys by the absence of evidence of such affections on examination of the urine; from phthisis, cancer, malaria, and other toxæmic and cachectic conditions by absence of their peculiar phenomena and history; from leucocythæmia by the examination of the blood; for though the red discs are few and much diminished in size, the leucocytes are not materially increased.

Treatment.—Treatment here, as in other allied affections, affords little hope of material benefit, and almost none of cure. The uncertainty of diagnosis in some cases may give grounds for hope and motive for effort, and the remedies for anæmia in general are indicated. They consist of the most nourishing and easily digested food, nutritive enemata when the stomach is weak or irritable, and the use of bitter and ferruginous tonics. The iodide of iron, the extract of malt, and the preparations of pepsin are perhaps worthy of a trial.

SIMPLE ANÆMIA.

Anæmia in general, or a deficiency of blood, including all its varieties, consists essentially in a loss of balance between blood formation and blood destruction. There is either a deficiency in the income, or an excess in the expenditure, or both combined. The deficiency of production may depend upon defects in quantity or quality of food, or deficiency of oxygen.

Derangement in digestion, assimilation, or sanguification also results in a diminution of production; and these conditions may depend upon a variety of causes affecting the blood-producing organs.

Excessive blood destruction may be produced by excessive and prolonged muscular or nervous action, excessive secretion, inflammatory effusions, hemorrhages, albuminuria, tuberculosis, fevers, various cachexias, poisons, etc. Heredity, age, sex, occupations, and various defective hygienic conditions may produce the result.

Some of these conditions are temporary and removable, others are not so; and when the anæmia is dependent upon some other disease or well-defined pathological state, it is spoken of as secondary, and is to be regarded as belonging to the primary affection.

The term simple anæmia is applied where the condition is not dependent upon any other disease or well-defined and recognized pathological state, but where the anæmia is the chief and apparently primary condition observed.

The pallor of the skin and prolabia, the blue tint of the sclerotic coat of the eyes, the irritability of the heart, and the hæmic murmurs —the common evidences of anæmia—are readily discovered. When not extreme, the face may be sufficiently tinted, especially under excitement, and then the other conditions must determine its presence. A variety of symptoms accompany anæmia and become evidences of its existence. The most marked are the phenomena referable to the nervous system. These are more marked in women than in men, and anæmia is more common in the female sex. They consist of neuralgias, hyperæsthesias, often of morbid emotions and excessive impressibility, mental depression and anxiety, and, not unfrequently, of undue apprehension of serious disease. Coldness of the extremities is common; the heart is easily excited to rapid and often tumultuous action; the respiration is increased by moderate exertion, or by mental emotions; there is often tenderness along the spine and in the intercostal spaces; but a diagnostic symptom which is quite conclusive is a hæmic murmur at the base of the heart, a venous hum heard when the stethoscope is applied to the neck, and a systolic blowing sound heard in the carotid artery.

Treatment.—The treatment of these forms of anæmia is more encouraging. The first and most important thing to engage the attention and efforts of the physician is the removal of the cause, whatever that may be.

If the anæmia arises from lactation, the child should be taken from the breast; if from menorrhagia, bleeding piles, etc., these losses must be arrested; if from derangements of the stomach which prevent the digestion of a proper quantity of food, they should be corrected, and a proper diet should be given.

As there is diminution in the red blood discs, and as iron enters largely into their composition, the ingestion of iron would seem to be indicated, and experience has proved that this is the chief remedy. There are many preparations of this metal used in medicine, all possessing certain properties in common, but each having peculiar properties of its own which render it specially applicable to particular conditions. A change in the form of iron from time to time often increases the efficiency of the medicine, or blood food, as this article may be called. The citrate, lactate, sulphate, iron by hydrogen ; the muriated tincture, with dilute phosphoric acid ; the pyrophosphate, and the dialyzed iron may be chosen from. Sometimes it is well to combine other agents with the iron—a preparation often very useful is the citrate of iron, quinine, and strychnia.

In many cases the iron requires to be long continued. Unfortunately there are some persons upon whom iron produces unpleasant effects—such as a sense of fullness in the head, derangements of the digestive and generative systems, etc. There are others who fancy themselves unpleasantly affected without sufficient reason ; and, as a rule, a perseverance with moderate doses can be well borne. As anæmia generally depends upon wrong action in some of the organs of the body, alterative medicines continued for a time, will frequently produce a more marked beneficial effect than the iron. Thus the iodide of potassium, the chlorate of potash, and even small doses of mercury, will often change actions and commence an improvement which the iron had failed to effect. This, in my own experience, has been so frequently the case, that it seems to me attention should be particularly called to the fact. Recent fashion has tended too much, in various diseases, to the use of an exclusively "tonic and supporting" course, neglecting alterative and eliminative measures. The bowels should always be regulated when constipated and deranged, and the secretions of the liver should often be modified. The chlorate of potash often exerts a peculiarly beneficial influence over the process of ultimate nutrition, and will sometimes remedy an anæmic condition which iron will fail to remove.

The diet and other hygienic conditions should of course receive particular attention. Life should be as much as possible in the open air ; sea air and sea bathing with some, country or mountain air with others, and a variety of food, will be useful ; but with most a good proportion of nitrogenized food—beefsteak, roast beef, mutton, fowls, etc., will be required. Cod-liver oil and extract of malt will be beneficial to some. In simple anæmia the patients may with truth be assured of the absence of serious organic disease, which they frequently so much fear ; and this assurance will often contribute largely to the cure.

CHLOROSIS.

The term chlorosis is given to a form of anæmia commonly occurring in young females not far from the period of puberty, and is connected with some derangement of the menstrual function, or with the development of the sexual system. It is characterized by the ordinary phenomena of the anæmic state, with the addition of a greenish tint of the complexion, which gives the disease its name. There is often a depraved appetite, a desire for clay, slate, chalk, or other indigestible substances.

The treatment will be the same as for other forms of anæmia, while special attention is given to the restoration or correction of the menstrual and other uterine and pelvic conditions. Change of air and associations, the management of the mind and the correction of all other morbid conditions of the body should receive attention. A more particular account of this condition and the means of managing it, will be found in works on Diseases of Women.

ADDISON'S DISEASE.—BRONZED-SKIN DISEASE.—SUPRARENAL MELASMA.

Although this has been classed among local affections—as a disease of the suprarenal capsules—yet the absence of well marked disease in those organs in so many cases, and the prominence of general symptoms, and especially of anæmia, seem to entitle it to a place in this connection.

This affection, first distinguished and fully described by Dr. Addison, of Guy's Hospital, London, and hence called by his name, is characterized by progressive debility and anæmia, but without great emaciation. It is, however, particularly distinguished by a peculiar discoloration of the skin, commencing on the parts most exposed to the light, as about the face and forehead, or sometimes on parts where a blister has been applied, but extending to different parts of the body—to the genital organs and inside the thighs, to the parts about the umbilicus and elsewhere. In some rare cases this discoloration is quite uniformly spread over the surface, causing the person to present the appearance of a mulatto, though often with more of a tinge of green; while in others, the discoloration is slighter and more partial, though the general symptoms are the same.

This discoloration, so important a characteristic of the disease, must be distinguished from that accompanying pityriasis niger; from protracted jaundice, where a very dark color is sometimes assumed; from the yellow-brown color of chloasma; the mossy appearance in some cases of pregnancy and debility from uterine and stomach diseases; from the discolorations resulting from exposure to the sun and weather in hot regions; and from filth and vermin anywhere.

The symptoms and course of this affection are not materially different from those of pernicious anæmias, and need not therefore be detailed at length. There is progressive debility, sometimes nausea and vomiting, not unfrequently cephalalgia, often a peculiar hardness or bony feeling of the fingers, and gradual failure of the heart's force; the intellect remaining intact until near the last, when delirium, and finally coma, may supervene.

The bronzed color usually increases gradually in area and deepens in intensity as the case progresses. A fatal termination is finally reached; but the duration of the disease varies from a few weeks, in exceptional cases, to several years, though in a majority of cases death takes place within a year. The mode of death is usually by gradual asthenia, though sometimes by syncope after exertion. It is seldom or never that coma is so profound as to suspend first the action of the brain.

There has been much discussion as to the pathology of this disease, and it is by no means fully settled. At one time, from the fact that in several cases a tuberculous disease of the suprarenal capsules was found on post-mortem examination of those dying of the affection, it was supposed that the function of these bodies was to regulate the chromatogenous phenomena in the system, and that in consequence of their being diseased in this peculiar way the discoloration followed. The disease was therefore regarded as a local affection of these bodies, the bronzing and other symptoms following as a consequence. This restricted view can scarcely be maintained. Although in a majority of cases the suprarenal capsules are found diseased, this is not always the case; and in many instances no tubercular disorganization can be discovered. In a recent case, where a medical friend succumbed to the disease, the only thing observed about these capsules was that one was much smaller than the other; but this is often the case where no such disease has occurred. In this instance the disease was well marked in all its features; it began with general weakness, the discoloration came on gradually and extended, and the disease continued several months after it was recognized.

In the present state of our knowledge, notwithstanding the labors of Addison, Wilks, Robin, Pepper, and others, the pathology of the disease is obscure. It seems to me probable that its seat is in the organic or ganglionic nervous system, that a peculiar perversion of nutrition and coloration follows, and that the disease of the suprarenal capsules, so often found, is rather an incident or result of the organic nervous perversion than a cause of the symptoms. This opinion is suggested by the symptoms, but is strengthened by the fact that alterations in the solar plexus and semi-lunar ganglia have on several occasions been observed. The subject, however, requires further investigation; the condition of all the organs and the blood should be more carefully examined, and attention should not be confined to the suprarenal capsules.

Although the disease, after its full and unequivocal development, so far as it is known, has gone on to a fatal result, yet I have seen a few cases where an appearance like that of incipient Addison's disease was followed by recovery. In these cases, after the existence for some time of debility and anæmia, with no other discoverable cause, discoloration of the forehead and face, of a character not distinguishable from that of this affection commenced; but in time, under the use of iodide of potassium, hydrochlorate of ammonia, and iodide of iron, the discoloration slowly disappeared, and health was restored. One case of a gentleman, formerly of Michigan, now in Kansas, was under observation and treatment for several months with symptoms such as described, but the patient has been in fair health for the last seven years. The bronzed appearance of the face, when last heard from, had disappeared.

I am not prepared to affirm that these were cases of Addison's disease, but the symptoms were of a character to excite the strongest suspicion that they were of that nature. Should other cases of a similar character occur to me, I should pursue a similar course, and not without hope of benefit.

Dr. Flint refers to a case seen with Dr. Rockwell, where general electrization was followed by marked improvement after some thirty applications; the improved condition continued for two years, when the strength suddenly gave way, and the patient died within twenty-four hours.

Treatment.—The treatment of fully developed cases, though so unsuccessful, should not be entirely abandoned, as the progress of the disease may be delayed and the patient made more comfortable. A general tonic and alterative course seems to be indicated, and special distressing symptoms must be met as they arise. The vomiting, when it occurs, may be allayed by various means: by spts. of chloroform in a mixture of glycerine, small doses of morphia, or by other anti-emetics. The strength should be kept up as much as possible by nutritious and easily digested food and tonic medicines. The phosphate of iron, the hydrochlorate of ammonia, quinine and strychnine, ext. of malt, cod-liver oil, etc., may be tried. In excitement of the brain bromide of potassium would be indicated. In the early stage of the disease the salts of iodine, it seems to me, should have a fair trial. But as no articles have an established reputation as curative agents, a course of symptomatic and palliative treatment is chiefly to be pursued. In view of the past achievements in medical science and art, the hope may be entertained that the pathology of this affection will hereafter be better understood, and that some means, much more effectual than are now known, will be found for its relief.

DIABETES MELLITUS.—GLYCOSURIA.—GLYCOHÆMIA.—MELITURIA.

Diabetes Mellitus may be defined a constitutional disease, produced through errors in the process of assimilation, either in the stomach and intestines, in the solid viscera, especially in the liver, in the general tissues, or in the blood. It is characterized by an increase in the quantity of urine, which contains a saccharine substance resembling grape sugar; this condition is accompanied with excessive thirst, often a ravenous appetite, but generally with progressive emaciation of the body. In many cases a wasting of the lungs by destructive changes occurs in the course of the disease; in some there is impairment of vision, often by opacity of the lens; generally there is a dry and harsh skin, not unfrequently constipated bowels, and often impairment of various brain functions. The disease is obstinate, sometimes protracted and fluctuating, but in a large majority of cases ultimately fatal. Death may occur from general wasting and gradual failure of power, from intercurrent local affections, or from such changes in the blood as will more speedily interfere with its functions. Many isolated facts respecting this disease have been observed, but the full details of its pathology are not yet established.

From time out of mind, cases of a large discharge of urine, with thirst and emaciation, a voracious appetite but progressive weakness, have been observed, to which the name of diabetes has been applied. About two hundred years ago it was discovered that such urine had generally a sweet taste, though in some rare cases a free flow had not that quality. This gave rise to the distinction of diabetes mellitus and insipidus. About a hundred years ago sugar in the blood was discovered in diabetic patients, constituting what is now called glycohæmia. Soon after this, sugar was separated from the urine; and soon it was found that the avoidance of sugar and starchy matters in the food, and confinement to an animal diet, diminished the quantity of the urine and the sugar in it. In 1815 it was found that the sugar of diabetes was like grape, and not like cane sugar. Some ten years later it was discovered that starch was converted into sugar in the alimentary canal; and a dozen years later sugar was found in matters vomited by diabetic patients. In 1848 Claude Bernard announced that animals as well as vegetables had a sugar-creating power, and that the liver was the organ in which elements were brought together which produced the saccharine matter. In a short time after, he also found that saccharine urine could be produced in animals by irritating mechanically the floor of the fourth cerebral ventricle. In 1853 it was further discovered that alcohol injected into the portal vessels produced sugar in the urine. Soon again it was found that this production of sugar in the liver goes on after death, and even when the liver is removed from the body. Previous to this time it was held, and is still taught by some, that the sugar formed normally and freely in the liver was burned off in the lungs; but in 1856–7 it was announced that normal sugar formed in the liver was not burned in the lungs, but disappeared from the blood as it passed through the capillaries in the general tissues, and that the sugar was there appropriated to the nourishment of the tissues and the sustaining of the body.

Soon after this it was further found that before albuminous substances reached the state of sugar—albumen being capable of that conversion—they first passed through the transitional state of glycogen—a sort of animal starch, but a substance very readily passing into the condition of sugar. In 1859–60 a small quantity of sugar was found to exist in healthy urine; a quite considerable quantity sometimes, especially after the ingestion of a free quantity of that substance; and it is now well known that in lactation and pregnancy, and in various morbid states, sugar may appear in the urine without producing the other phenomena of diabetes, or being produced by that condition, and that saccharine urine does not necessarily imply diabetes, any more than albumen in the urine proves the existence of Bright's disease. Albumen is in the urine in Bright's disease, as sugar is in the urine in diabetes, but in both instances the respective substances may be produced by other causes. In 1871 it was found that in an advanced case of diabetes, with the continuance of the emaciation, the thirst, the debility and other general symptoms of the disease, a free watery diarrhœa completely replaced the free flow of urine, and it was found by a careful analysis that the discharges from the bowels contained a large quantity of sugar, even when a diet almost exclusively composed of animal food was taken. This case in a young man occurred under my own observation in the Hospital of the University of Michigan, and the analysis of the intestinal discharges was made in the chemical laboratory of the University.

Still later, Dr. Pavy announced that defibrinated *arterial* blood injected into the portal vessels causes saccharine urine; and he suggests the theory that by vaso-muscular paralysis and distention of capillary vessels, blood passes rapidly from the arteries to the veins without losing its oxygen, and without being converted into venous blood, and that this causes the large production of sugar which enters the circulation and passes off in the urine, constituting the disease. It is found that the spores from the puff-ball, when inhaled, cause sugar in the urine; and it is suggested that these spores produce this effect by paralyzing the vaso-motor nerves.

It has been observed occasionally, and more than once by myself, that diabetic patients, in rare cases, in a stage of the disease not far advanced, die suddenly, or in a day or two, after severe symptoms occur, in a state of asphyxia. It has very recently been discovered that in these a rapid fatty degeneration of the blood occurs, or at least large quantities of fat are found in the blood, and large quantities of it accumulate in the capillaries and small vessels of the lungs, obstructing the circulation and oxygenation of the blood, and causing death by apnœa. In these cases not only is there *fat embolism* of the lungs, but the quantities of fat found in the blood are so great that they can be collected in large amounts. Notwithstanding these facts, and others which are well known to occur in the course of this disease, the manner in which the changes are brought about, and the real causes of the disease, are matters of conjecture.

The formation of sugar somewhere in the organism, a fact admitting of no question, is not the result of simple oxidation producing heat, but a true assimilation, the sugar being produced in the form of glycogenous matter. This substance is present in all the tissues, and is not obtained alone from starch and sugar ingested, but also from *albuminoids*, and, in the absence of food, from the elements of the blood and the tissues of the body. In a diabetic patient, sugar often appears in the urine in considerable quantity, when he has long abstained not only from starch and sugar, but from all food, while the production of sugar and the wasting of the body prove that the sugar comes from the conversion of the elements of the blood and the tissues into this material.

The gastro-intestinal theory advanced by Prout and others, that the sugar of diabetes was entirely formed in the alimentary canal in consequence of some wrong process of digestion there, is opposed by the fact that sugar in the alimentary canal is not normally absorbed directly into the blood as such, but is to a large extent at least formed into lactic and butyric acids; and that when only .6 (six tenths) part in 100 of sugar are in the blood, sugar is readily found in the urine. But the theory is positively disproved by the fact just stated, that diabetes may exist when no starchy or saccharine food is taken, and the sugar appears in the urine when for a considerable time all food has been abstained from.

The Hepatic theory, following the discovery by Bernard of the glycogenic function of the liver, was to the effect that in diabetes the liver becomes too active in the production of sugar, forming by an augmentation of its normal functional power more than can be burnt or changed in the lungs or elsewhere in the blood, or more than can be appropriated by the tissues, and hence the sugar goes into the urine. This excessive production of the sugar was thought to be less the result of any lesion of the liver itself than of the innervation controlling it. But this theory, which is still held by many, was opposed successfully, at least as an exclusive theory, by the observations and arguments of Pavy, who contended that the liver does not produce *sugar* by its physiological action; but that it contains, in free quantities, glycogen, or what he calls *Hepatine*, to the production of which sugar carried from the alimentary canal to the liver contributes; and that this hepatine *post mortem* is speedily converted into sugar; and that when sugar is found in the liver, or in the hepatic vein, or right side of the heart, to any considerable extent, it is a *post-mortem*, or rather a pathological result, and not physiological.

The pulmonary theory of diabetes was, that the sugar normally produced in the liver was physiologically burned in the lungs, but that in diabetes the lungs failed to perform that function, and allowed the sugar to pass on into the general circulation to be excreted by the kidneys. This theory is not sustained, as it is not shown that sugar is physiologically consumed in the lungs. On the contrary, the experiments of Pavy go to show that there is no more sugar in the blood entering the lungs than in that coming from them.

Another theory is that the blood is the seat of the disease; that in it, and by means of its oxygen-carrying globules, the sugar produced in the liver, or gaining access to it from the alimentary canal, is physiologically oxidized, as the pulmonary theory held it to be, in the lungs; but that the blood, failing to perform that function, left the sugar to be eliminated by the kidneys. But this theory is unproven; indeed it appears to be disproved by the same observations and facts which show the fallacy of the pulmonary hypothesis.

Neither is it shown that sugar is oxidized in the systemic capillaries, but, on the contrary, as much sugar is found in the venous as in the arterial blood.

It must be admitted, as stated by Jaccoud, that diabetes is not an exaggeration of a physiological action, not an increase of the physiological function of the liver, but a diseased action arising from causes not understood; an aberration in nutrition and assimilation which at first may be limited and partial, but in the progress of the disease becomes more complete.

It is evident, from all the facts, that the source of the sugar is not always the same. That sugar and starch ingested furnish the elements for a large part of the sugar which is produced in diabetes is evident from the fact that when these articles are taken much more diabetic sugar is produced than when they are excluded from the food. But it is evident they are not the only source, from the further fact that this sugar is produced in their absence. It seems probable that these substances taken into the stomach are, either in the form of sugar or of lactic or butyric acids, to a large extent taken into the portal veins and carried to the liver, contributing to the production in that organ of glycogen, and probably, physiologically, to a certain small proportion of sugar there; that physiologically this glycogen is elaborated further in the liver into fat and other materials for the supplying of force and the support of the tissues; that in the perverted action which occurs in diabetes, either the elements taken into the liver are not converted into glycogen, or, if so, are reconverted into sugar either by the direct but perverted influence of the liver, or, in its suspended influence, by the action of chemical laws; that albuminoid and fatty foods are capable, but to a more limited extent, of the same transformations as the amyloid and saccharine; that the blood and materials from the tissues are also capable of similar transformations; and that sugar, whenever and however produced in the system and obtaining admission into the blood, is probably incapable, at any rate excepting to a limited extent, of further changes, and is carried out of the body generally by the kidneys, but in exceptional cases by the alimentary canal.

The immediate causes originating these changes are obscure, but they probably have their seat in the brain and nervous system. This appears from the well-known fact that the nerve-centres not merely control influences, but all the functions of the body, animal and organic, and from the further fact that irritations, injuries, and morbid conditions of those centres in the brain, medulla oblongata, and spinal cord, and even irritation of the pneumogastric and other nerves, seem capable of inducing saccharine urine and the other phenomena of diabetes.

As nearly as the present state of our knowledge will enable us to determine, we may say, that diabetes is a neurosis, disturbing the harmony and proper action of the assimilative functions in such a manner as to produce more than the normal quantity of sugar in the system, and as a result the other changes which constitute diabetes.

Dr. Harley, regarding the production of a certain amount of sugar and its appropriation in the system as physiological, makes two varieties of diabetes—one from the excessive formation of sugar, and the other from defective assimilation or appropriation of normally formed sugar by the tissues of the body, thus allowing of its running to waste in the system. If a portion of sugar is normally appropriated by the tissues, a supposition which no facts in our possession will enable us to positively deny, it is likely that in some cases a diminished appropriation of the sugar is a prominent feature of the disease, and may contribute to the phenomena that arise.

There are some clinical facts which seem to favor this view. Though most cases are benefited by an animal diet, which affords less material for the formation of sugar, it is affirmed that in other, but rare cases, confinement to such a diet does no good, but rather harm—a diet in which starchy and saccharine matters abound agreeing best. When excessive formation of sugar is the chief condition, the patient is not necessarily emaciated and weak. He may for a considerable time be fat and ruddy ; but where defective appropriation is the chief condition (if such a state is possible), emaciation is one of the earliest conditions, and the first to attract attention. That clinical varieties presenting these different features as to emaciation and loss of strength appear, must be well known to all practitioners of experience ; and it is possible that this view of Dr. Harley may furnish the explanation. This, however, is but a conjecture, but is one worthy of being considered in so obscure a disease.

The remote *causes* favoring the production of diabetes are various. The influence of age is not the same in the two sexes. In men it is more frequent between thirty and forty ; in women, between ten and thirty ; but it may occur at any age in either. Young girls and girls in their teens are more subject to it than boys, and with them it is usually rapid in its course. It is more common in men than in women ; heredity has some influence ; and some diseases, as gout and syphilis, and cold, depressing emotions, and some lesions of the spinal cord and brain tend to its production.

Pathological Anatomy.—The changes always present are, the abnormal quantity of sugar in the blood, and an increased quantity of fat. This latter in rare instances is so great as to cause fatty embolism of the pulmonary vessels, and asphyxia and death. I recently saw in the possession of Mr. Hamilton, the Pathologist of the Edinburgh Royal Infirmary, a specimen of half a pint or so of blood, taken from a patient dying suddenly from diabetes, of which a large proportion was clear liquid fat.

Various alterations of organs are sometimes found, but these are not characteristic or constant. There may be dilatation of the stomach and hypertrophy of its tunics; the kidneys may be injected, enlarged, or flabby, sometimes softened and sometimes denuded of their tubular epithelium in consequence of overwork in carrying off so much saccharine urine; other accidental affections, such as cysts and calculi, may occur, and in rare cases there may be a combination of Bright's disease.

Atrophy of the pancreas has not unfrequently been observed; and lesions of the liver are quite common. It may be hyperæmic, there is sometimes hyperplasia, hypertrophy, atrophy more rarely, and fatty infiltration of liver cells. In consumptive cases, dying slowly, hyperæmia may not be observed.

Nervous lesions are not rare, but they are not characteristic. There may be congestion, induration, softening, hemorrhagic spots, tumors, etc., in the fourth venticle, or in any part of the brain or spinal cord.

Alterations of the peripheral nerves—hypertrophy of the renal plexus and the sympathetic—calcareous concretions on the nerves with degeneration of the neighboring nerve substance are sometimes found.

Symptoms and Course.—The leading symptoms have already been alluded to in the definition of the disease. They may be divided into primary and secondary—the primary being constant, while the secondary may be wanting.

The primary are glycosuria, polyuria, polydipsia, polyphagia, and autophagia. These, except the last, appear contemporaneously. The last, the consumption or feeding upon the tissues, generally occurs at a later period more markedly, though sometimes it is early in the history of the case. The appetite is not so uniformly increased as the thirst, and the increase of the quantity of the urine is not always decided, though usually it is marked, and is often very great. The sugar in the urine is the most constant symptom, and yet on an animal diet that may temporarily disappear.

In a fair and fully formed case of diabetes, the patient, a full-grown man, taking a usual diet, as much as the appetite demands, and as much drink as the thirst calls for, will pass 320 fluid ounces, or twenty pints, of urine in twenty-four hours, of the high specific gravity, chiefly in consequence of the sugar present, of 1.040. In this there will be 12,329 grs. of sugar and 1,559 grs. of urea. The quantity may vary much in each direction, but is more frequently below than above these figures.

There are sometimes intercurrent diseases which exert an influence upon the diabetic symptoms. Scarlatina, pneumonia, acute affections of the intestines, and gastric fever are said to suppress the glycosuria; while intermittent fever, variola, and pleurisy have not that effect. (Jaccoud.)

The statements made by different authors respecting the quantity of urea excreted in the twenty-four hours vary. Some declare the quantity on the whole increased, others diminished. Undoubtedly there are great differences in different cases. Where emaciation is progressing, the azotized tissues are being consumed, and while free quantities of azotized food are taken, the urea is increased. When emaciation is not rapidly progressing, and when but moderate quantities of food are taken, the urea is diminished.

Uric acid does not undergo constant changes. Hippuric and phosphoric acids are not specially modified. Sulphates are said to be increased to double their normal quantity, and chlorides still more. Creatinin is sometimes, at least, enormously increased, according to some authorities to twenty times the normal amount. When this is the case, urea would be likely to be diminished. Albuminuria is sometimes present, but is not a constant symptom. The increase of urine produces increase of thirst, and they are usually proportionate. The increase of appetite, so common, may not occur when some special stomach derangements are present; and dyspepsia, gastralgia, acid eructations, vomiting, and diarrhœa may exist, the discharged matters often containing sugar. As in the case already related, the diarrhœal discharges may take the place of the polyuria and the glycosuria. The autophagia—the feeding upon the tissues—is sooner or later a condition which occurs; but it is developed at different times in the course of the disease. When the sugar is formed from the albumen of the food or the tissues, urea is increased.

There are various *secondary symptoms* dependent on the different primary states. Those dependent on glycæmia, or the sugar in the blood, are, altered secretions, lesions of the teeth and gums, impotency, sterility, amenorrhœa, anthrax, erysipelas, boils, pneumonia —catarrhal and fibrinous—bronchitis, and gangrene.

The phenomena dependent on the glycosuria are, irritation and redness of the meatus, pruritus, phimosis, balanitis, and fungoid growths about the frænum and vulva.

Those dependent on polyuria are, habitual constipation, dryness of the skin and mucous membranes, and great decrease in the pulmonary and cutaneous exhalations, the normal quantity of from 12,000 to 15,000 grammes being reduced in extreme cases to 529 grammes. (Jaccoud.)

The phenomena due to the consumption of the tissues are, ulceration of the lungs; pulmonary phthisis of a peculiar form, distinguished by the scantiness of secretions, rapidity in formation of cavities, and by the absence of hæmoptysis; cataract of a somewhat peculiar kind also, and amblyopia; and nervous troubles, such as anæsthesia, hyperæsthesia, neuralgia, excessive sensations of cold, etc.

The temperature is often lower than normal in the advanced stages, and some patients desire a very high external temperature to be comfortable.

The *progress* of the disease varies. It may be slow, with remissions which may be mistaken for cures. In the first stage cures may possibly be effected. Death by gradual wasting and marasmus alone is rare, pulmonary and other lesions more commonly contributing to the result.

Prognosis.—The *prognosis* is always grave, and the rapidity of the disease is usually much greater in the young than in those advanced in age. It is often remarkably rapid in young girls. In one case which I observed in the family of a physician, death occurred in a week or two after the symptoms first attracted notice, though they had doubtless existed in moderation for some time before.

Pulmonary lesions, troubles of sight, and cutaneous inflammations are unfavorable symptoms.

Constant decrease in the polyuria and glycosuria, if not accompanied with profuse saccharine perspiration or diarrhœa, is an encouraging sign.

Diagnosis.—The *diagnosis* of diabetes is to be made by observing the symptoms which have been described—particularly by the large quantity of urine passed, its high specific gravity, and its containing sugar as discovered by the proper tests. The peculiar fruity odor of the breath, the thirst, the emaciation notwithstanding the free quantity of food, will aid.

The presence of sugar in the urine distinguishes it from simple polyuria or diabetes insipidus.

It should be borne in mind that moderate quantities of sugar, but sufficient to give its reaction with tests, are found in several other conditions than that of diabetes. It seems to be present normally in women during parturition, during lactation, and with some during pregnancy. It often occurs in paralytic patients; it may result from blows upon the head; may occur in dyspeptics and the aged, and in children during dentition. Certain medicines—the nitrate of potash, oxide of carbon, the salts of mercury, etc., may cause sugar in the urine. Diabetes implies a persistence of saccharine urine, and the other associated conditions described.

Treatment.—The most important item of treatment is the dietetic. There can be no doubt that starch is to a considerable extent converted into sugar in the mouth, stomach, and intestines ; and that the sugar so produced, as well as that ingested, though in part changed into other substances—especially lactic acid—to some extent at least finds its way, in part through the lacteals and the thoracic duct, directly into the blood, while other portions, either in the form of sugar or of other substances readily converted into it, go through the portal vessels into the liver and from it reach the blood ; and that starchy and saccharine matters produce more sugar to be carried out of the system than any other forms of food. Abstaining from these articles causes a diminution in the amount of sugar in the urine, and a consequent diminution in the quantity of urine passed, since it is the presence of sugar and the amount of water required for its solution and transportation out of the system which increases the flow. This must be regarded as palliative of the symptoms rather than curative of the disease ; but palliation here, as elsewhere, not unfrequently results in more radical improvement. As a rule, this dietetic plan is advisable, and it is certainly recommended by all standard authorities on the subject. It should generally be pursued until there is a progressive decrease in the glycosuria ; and when this course is taken, there is usually a marked improvement in the general symptoms and condition of the patient. Unfortunately, however, this is not always the case. The quantity of sugar and urine excreted may be diminished while the patient continues to lose flesh and strength ; the stomach becomes deranged, the appetite may fail, and improvement may follow a resort to a more ordinary or mixed and amylaceous diet. Such facts have induced Dr. Harley to make in his description the two varieties of the disease, and to regard cases of this kind as dependent more upon deficient appropriation of the elements of the sugar for the nourishment of the body and the production of force, than upon the excessive formation of sugar in the system. These exceptional cases do not invalidate the rule ; and often the improvement on an animal diet is very remarkable. As an instance, Dr. Pavy reports a case where, with an ordinary mixed diet, the patient passed 10,500 grains of sugar in twenty-four hours, but when restricted to meat, beef-tea, and jelly without sugar, the quantity passed in the same time was but 594 grains ; and that as the sugar diminished the patient improved strikingly in appearance, health, and strength ; and what must be considered as exceptional, did not get tired of his diet. Greens were allowed, such as lettuce, spinach, cresses, etc., as they were found to do no harm. Dr. Pavy says, as long as the sugar is kept down to from 1,000 to 1,500 grains a day, his experience would indicate that the patient is not conscious of the existence of his complaint. The presence of a free quantity of sugar in the blood interferes with the performance of the normal function of that fluid ; but when the quantity is small it may perform its proper office and comparative health may be enjoyed. Where the increased formation of sugar is the chief morbid condition this treatment is efficient. It is worthy of a trial in all cases. The smaller the quantity of sugar passed through the system the better. It not only interferes with the proper function of the blood, acting as a foreign and poisonous agent, but it carries off other elements of food, washing them away in the flood of water necessary to hold in solution the sugar. The diabetic patient, then, should be confined as much as possible, without impairing nutrition, to an azotized diet—to albumen, fibrine, caseine, gelatine, and gluten—to flesh, eggs, etc. Lately a pure skim-milk diet has been strongly recommended. Should there be albuminous urine there might be a double indication for the milk diet. But a variety of azotized articles of food should generally be allowed ; and if judicious selections be made, and pains be taken to render the articles acceptable to the taste as well as digestible and nutritious, and the articles be frequently varied, the azotized diet may often be continued for a long time. Dr. Flint advises that a diabetic patient be furnished with a list of articles which may be allowed, and of those which are forbidden. He gives the following as articles of food and drink containing no starch and sugar, or a quantity so small as not to be practically important :

"1. All kinds of meat and poultry (excluding liver) either boiled, roasted, grilled, or in the form of soup or jelly, with any kind of seasoning or sauce which contains neither flour nor sugar.

"2. Fish of every sort, inclusive of turtle and terrapin, lobster, clams, crabs, shrimps, and oysters.

"3. Eggs, cooked in any form, with the exception of sweet omelets or sweetened custards.

"4. Cream, cheese, butter, buttermilk, and, in moderate quantity, milk.

"5. Cabbage, lettuce, cucumbers, pickles, spinach, beet tops, tomatoes, sorrel, endive or chickory, radishes, mushrooms, cauliflower, Brussels sprouts, asparagus, truffles, dandelion, artichokes, oyster-plant, celery, spring onions, water-cresses, and olives. The allowed vegetables may be eaten raw, boiled, fried, or made into salads.

"6. Coffee and tea, with the addition of cream, and glycerine, if agreeable, as a substitute for sugar."

Dr. Flint includes some of the alcoholic drinks, but as these can seldom serve any useful purpose, and as experiments have shown that introduced into the portal vessels of animals they cause the production of sugar, they should be excluded from the diabetic dietary, and, if used at all, should be prescribed for the purpose of fulfilling some special indication strictly as drugs. They can be required as such in this disease only very exceptionally. Water may be allowed in any reasonable quantity to quench thirst, and buttermilk, if relished, may also be permitted.

8. "Gluten bread, and bread made from finely ground bran after Champlin's method. In the use of these substitutes for ordinary bread, much depends on the mode of preparation. They may be made palatable by the use of eggs and butter, together with varying modes of preparation. Pavy's almond flour may be used for the sake of change. If these substitutes for wheaten bread become repulsive, thin slices of the latter, toasted very much, and almost charred, are allowed in small quantity."

A gluten flour is prepared especially for diabetics by the "New York Health Company," No. 74 Fourth Avenue, New York City, which is said to contain only a very small proportion of starch, and to make a very palatable bread. According to the accounts it meets the requirements in diabetic cases. Champlin's bread is made of wheat bran, which has been boiled a short time and washed in two successive waters, and again washed in cold water and passed through a sieve to remove all starch. It is then thoroughly dried in a slow oven, and when perfectly crisp ground in a fine mill, and passed through a very fine sieve by the aid of a brush, and all that is not perfectly fine and soft is reground. Three troy ounces of this bran powder, three fresh eggs, one ounce and a half of butter, and rather less than half a pint of milk, after melting the butter, are to be thoroughly mixed together, adding some agreeable spice. Immediately before putting into the oven, first thirty-five grains of sesquicarbonate of soda are to be stirred in, and then three drachms of dilute hydrochloric acid. The loaf should be baked in a basin, well buttered, for rather more than an hour. Biscuits may be prepared, omitting the soda and acid and a part of the milk. Sugar, bread of all kinds except such as indicated, macaroni, vermicelli, rice, Indian corn, barley, oats, and all starchy grains are forbidden. Potatoes, arrow-root, tapioca, sago, peas, beans, beets, carrots, parsnips, turnips, liver of all animals, and all saccharine fruits must be avoided.

This anti-diabetic diet should be rigidly enforced for a time at least, and its effects observed. If borne by the stomach and attended by improvement, it should be persevered with. If not well borne, and improvement does not occur, it should not be long continued. Some of the interdicted articles may be allowed and the effect observed, the urine examined, and the further management of diet governed by the conditions of each case. The success in staying the progress of the disease will depend largely upon the care and skill exercised in carrying out the dietetic management. The importance of the matter has called for the details so fully given. In observing the effect of diet or of medicines on the conditions of the urine, ascertaining by measurement the quantity passed in twenty-four hours, and its specific gravity as tested by the urinometer, will answer for ordinary practical purposes. The chemical tests for the presence of sugar and, means of quantitative analysis are given in the special works on the subject of urine analysis, to which the reader is referred.

To relieve the kidneys of their burden of work, the skin should be kept as active as possible by warm baths and frictions; and hot-air baths are often preferable. Cases are related of complete cures apparently affected by hot-air baths daily taken for a long time.

Great care should be exercised to prevent exposure; flannel should be worn next the skin, and all necessary means should be used to prevent the blood from being driven from the surface to internal organs. The cold bath has been recommended by some, but it should not be used unless a speedy reaction is certain; and to remain in the water for any considerable length of time would be dangerous. Cases have been known to result fatally at an early stage of the disease after a protracted cold bath.

Many medicinal agents have been employed, and cures have been reported as resulting; but the articles are so various and the failures so common that but little confidence can be placed in any of them.

It was stated that alkalies—soda and potash—injected into the portal vessels and carried into the liver of animals, prevented the conversion of glycogen into sugar, and before this was known, alkalies were administered as the result of the experience of their good effects. They usually lessen the amount of sugar. The bicarbonate of soda is recommended in doses of half an ounce in the course of the day, or as much as the stomach will bear. Combined with some bitter tonic larger doses will generally be borne, but the larger quantity mentioned will not always be tolerated long. The alkaline and saline waters of Vichy, or Ems, or Carlsbad, in Europe, are generally recommended with a course of bathing at these watering-places; and patients very generally improve for a time, and sometimes permanently, by the courses there pursued.

As the nervous system has much to do in the production of the disease, a soothing anodyne influence upon it often mitigates the severity of the symptoms. The two medicinal agents which, according to my observation, have most effect in diminishing the quantity of sugar and staying the progress of the disease, are the alkalies and opium. There are objections to their continued use, and particularly to opium; but it often stays the progress of the disease, and besides, in some cases, the sufferings from the perversions of the nervous system are so great as to justify its being prescribed, though a habit in its use be established. An occasional dose, a Dover's powder at night, will often procure rest, induce action of the skin, and be of decided service temporarily; but for the purpose of influencing materially the production of sugar and the course of the disease, the opium must be given in regularly repeated doses from one to three times a day. When there is pain to be relieved, and the medicine is long continued in order to keep up its anodyne effects, the dose, unfortunately, has to be increased, and the habit of opium-taking, one of the most inveterate of the narcotic-taking habits, is in danger of being established. This must be taken into the account. But in a case that is comparatively hopeless of recovery, or of a long continuance of life, that life may be prolonged and made much more comfortable by the drug. Where permanent improvement takes place and there is hope of cure, the physician must keep the control of this powerful agent for good or evil in his own hands, so as to have it discontinued when no longer needed. Other anodyne and narcotic substances may be useful for similar purposes. Conium maculatum, cannabis Indica, belladonna, and hydrocyanic acid are among the articles that have been used. When the stomach is irritable and vomiting is frequent, hydrocyanic acid is often particularly useful. When the pneumogastric nerves are supposed to be in fault, conium is thought to be indicated. In general cerebral irritation bromide of potassium deserves a trial. When the disease is chiefly from excess of formation of sugar from starchy and saccharine food, and the tissues are less preyed upon and assimilation less affected, the case is more hopeful. An animal diet, with the auxiliary aid from medicines, may then produce much effect.

As dyspeptic symptoms are often present, they should receive attention and treatment according to their character. Constipation if present should be relieved, and any special symptoms should be palliated as they arise. For these purposes, as debility is so prominent a feature, tonics are not unfrequently required. Iron, quinine, strychnine, phosphorus, ext. malt, cod-liver oil, pepsin, etc., may be useful for fulfilling various indications.

When defective assimilation is a prominent condition, the nerve tonics may be tried. Strychnia, phosphoric acid, the citrate, iodide, and bromide of iron would be suggested. Peroxide of hydrogen, ozonic ether, and electricity have been suggested and used, sometimes perhaps with benefit.

Experimental treatment has been largely indulged in, and may be justifiable in a disease usually so persistent and fatal.

Various articles, with the hope of producing some specific effects upon the disease, have been recommended, tried, and have fallen into disuse.

Lactic acid as freely as the stomach will bear has been recommended by some Italian physicians, and was said to be very efficient; but its reputation has not been confirmed.

Bakers' yeast, in table-spoonful doses three or four times a day, has been used, and sometimes with decided temporary benefit. Fermenting cider, rennet, and milk just turning sour have also been advised. It has been supposed that these fermenting substances favored the conversion of glucose into lactic acid, and thus prevented the formation of sugar. These, like some of the other remedies, are more applicable where the chief difficulty is in the increased production of sugar, but would have little or no influence upon defects of assimilation. Indeed, abstaining from a vegetable diet may be quite inefficient where the chief fault is in assimilation. In many cases where the sugar is diminished the disease is not cured, and sometimes the patient runs down faster from the restriction of the diet. In such cases the restoration of the ordinary diet, with a due admixture of animal and vegetable food may be demanded. Schultzen, as reported by Jaccoud, gave fifty grammes per day of pure glycerine, with alleged favorable results.

His formula is:

℞	Pure Glycerine........................	50
	Lactic Acid............................	5
	Spring Water..........................	100
	M.	

To be taken during the day.

Others have increased the quantity to one hundred grammes, and as reported with still better results.

Salicylic acid is said to have an influence in checking the formation of sugar, and glycerine is the best medium for its administration in diabetes. A drachm of glycerine dissolves five grains of the acid. It may be given of that strength or weaker.

For the "fat embolism" no remedy has been suggested, and evidently nothing can be done but to keep in action the functions of the heart and lungs as long as possible. We are in the dark as to any measures for preventing the fatty changes of the blood, which are the cause of these sudden deaths which sometimes though rarely occur.

For the dependent or intercurrent conditions, such as local inflammations, wasting of the lungs, etc., the treatment may require to be varied.

Diabetes is not to be treated by its name, nor all cases in the same way, but according to their special requirements and the best lights that we possess.

It is fortunate that a disease so little under the control of remedies is so rare in occurrence.

DIABETES INSIPIDUS.

EXCESSIVE URINARY SECRETION

Simple polyuria or hydruria or diuresis is a symptom which may accompany different conditions. In various states of nervous excitement, in hysteria, and under the influence of diuretic substances, large quantities of urine may pass; but these conditions, which are usually temporary, do not constitute the individual affection designated by the term at the head of this article. In certain diseases of the kidneys—in some stages and some cases of Bright's disease an increased flow of urine occurs, but this does not constitute the disease in question.

This affection exists when there is a notable persistent increase in the quantity of urine, the specific gravity being very low, and when neither albumen nor renal casts are present, and when there is no other distinct recognized disease, either of the kidneys or other organs, upon which it depends.

The quantity of urine passed varies much in different cases, but it may be ten or twenty times as much as the normal.

In such a loss of water from the system there is thirst, but whether the thirst and the free drinking are the consequences of the hydruria, or its cause, it is not always easy to determine. The urine when in such immense quantities has not more solid matter in it often than common spring water, being sometimes of a specific gravity of not more than 1.002; and cases have been reported where patients have drank their own urine in large quantities, when common water was not readily obtainable.

In some cases of this affection there are no other symptoms than the diuresis and thirst, and the only suffering is from the inconvenience of drinking so much, and voiding the urine so frequently. The danger in these cases is from the cerebral and kidney lesions which sometimes occur as causes, consequences, or concomitants of the affection. The disease is, however, obstinate, and left to itself usually persists until the patient succumbs, not so much from the diuresis, as from the other pathological states likely to appear.

Not many opportunities have been presented for examining *post-mortem* changes, but various morbid conditions of the brain and sympathetic ganglia and of the kidneys have been found. Inflammatory and degenerative changes have been found in the fourth ventricle; and tumors, syphilitic, tuberculous, and others, have been observed in this region and in the cerebellum. Degeneration of the solar plexus has also been seen; but the precise relation of these changes with the disease has not been ascertained. The kidneys have been found enlarged and hyperæmic, though sometimes the only change noticeable is dilatation of the tubules.

Diagnosis.—Diabetes insipidus is distinguished from D. mellitus by the absence of sugar in the urine and its light specific gravity, and from simple temporary diuresis by its persistence.

Treatment.—In the treatment of the disease, as the special condition leading to the symptom is believed to be an abnormal dilatation of the renal vessels, the use of ergot and astringents with a view of causing contraction of these vessels is rationally indicated; and various cases have been reported as successfully treated by ergot, in doses of a drachm gradually increased to two drachms of the fluid extract, three times a day, continued for several weeks.

Gallic acid, in doses of grs. xv three times a day, and valerian in large doses, have also been reported to be successful. A German physician has reported success with the use of a constant current of electricity employed along the spinal column and renal region.

When of syphilitic origin, the antisyphilitic treatment with iodides and mercury will often be promptly successful. Jaborandi or pilocarpin has been successful in some cases, and is worthy of a trial. The remedies to be selected from are iodide of potassium, ergot or ergotine, jaborandi or pilocarpin, and galvanism.

Warm clothing should be used, and a warm climate is preferable.

The general condition of the patient and the associated difficulties should of course receive attention.

DROPSY.

This is an accumulation of serous fluid in the tissues or cavities of the body outside of the blood-vessels and lymphatics, and though not an original disease of itself, but a symptom of other pathological conditions, those conditions are so various, and this symptom is so distinctive, that it is entitled to a brief separate consideration.

When a dropsical fluid is effused generally throughout the common areolar tissue it is called *General Anasarca.* When it occurs more locally in the same tissue or in any particular organ, as of the lungs, it is called *Œdema.* When effused in the peritoneal cavity it is called *Ascites;* when in the pleural cavity it is called Hydrothorax; in the pericardium, Hydropericardium; in the ventricles of the brain or between its membranes, Hydrocephalus; in the tunica vaginalis testis, Hydrocele; in the joints, Hydroarticuli, etc. When diffused more or less over the system it is said to be general; and when affecting particular cavities or parts it is called local dropsy. Dropsical fluid thus effused consists of the serum of the blood, more or less altered in different cases; but it contains albumen, salts, especially common salt, quite abundantly, and sometimes urea; and when connected with inflammation, fibrine is often present, and coagulated flocculi are seen; and it may contain corpuscles from the tissues, elements from the blood, cholesterine, and other substances.

Diagnosis.—It is distinguished by the enlargement it causes, by the fluctuation which may be felt when in cavities, by pitting when in the external areolar tissue, and by the changed functions of various organs from the pressure and obstructions produced. In the chest it may be discovered by physical signs.

Etiology.—Dropsy immediately depends upon mechanical obstruction to the flow of blood along the veins, or upon the presence of irritative or inflammatory processes, or upon some morbid condition of the blood or blood-vessels, or upon some obstructive disease of the lymphatic vessels or glands; upon too great pressure within the vessels, or upon some condition which modifies the normal osmosis, causing too much of the serum of the blood to pass outwardly through the coats of the vessels.

The more remote causes, which produce the particular conditions resulting in these effusions, are valvular or other diseases of the heart, obstructing the general circulation and causing greater internal pressure upon the venous system; or more rarely by obstructed circulation through the lungs producing a similar effect; or it may be caused by diseases of the kidneys which prevent a proper elimination of fluid and other materials from them, and thus cause accumulations in the blood and produce pressure and irritations resulting in effusions. In all these cases the dropsy is likely to be general. A general dropsy also occurs when the blood is so thin and watery that its density becomes lower than materials outside of the vessels, inducing exosmosis from them.

A more local peritoneal dropsy is produced by obstructed circulation through the liver, causing much congestion of the portal vessels;

and other local dropsies are caused by obstruction of the veins or lymphatics from any particular part by pressure or other causes; and dropsical effusions may be caused by irritation of the secreting surfaces and tissues concerned. In many cases of dropsy there is a combination of causes. Should there be obstructed circulation, as through the lungs, or heart, or in the general capillary system, with an impoverished state of the blood changing its osmotic relations, dropsy would be the more readily and extensively produced; and if to this were added deficient action of the kidneys or the drinking of larger quantities of fluid than could be eliminated by the emunctories, the dropsical condition would be still further increased.

A local irritation or obstruction added to a general cause will often produce large accumulations of fluid in particular parts or cavities; thus, in diseases of the heart or kidneys, or in conditions of spanæmia, a slight pleurisy will cause effusion in one side of the chest; or, in these general conditions, obstruction of portal circulation by a nutmeg liver, etc., will cause a special peritoneal dropsy with but little effusion elsewhere.

Disease of the kidneys is capable of producing dropsy in several different ways, viz., 1st. By failing to carry off sufficient water from the blood, thus increasing its bulk and pressure, diminishing its density, and increasing its disposition to exosmosis; 2d. By failure to eliminate sufficient urea, leaving it in the blood to irritate the serous tissues; 3d. By carrying albumen out of the blood, and thus impoverishing it and further diminishing its density; and, 4th. By obstructing the circulation of blood through the kidneys, and thus producing arterial congestion and increasing arterial blood pressure. The manner in which venous and lymphatic obstructions produce dropsy is sufficiently obvious, and the manner in which local irritations and inflammations cause serous effusions has been already explained.

Treatment.—The course and treatment of dropsy will depend upon its cause, or upon the character of the disease of which it is a symptom.

As a rule, aside from mechanical methods—tapping, aspiration, and punctures—the most efficient means of ridding the system of the accumulated fluid is by the administration of hydrogogue cathartics. The use of diuretics, when the kidneys are not so diseased as to render them inadmissible or inefficient, is another method of removing the dropsy; and the administration of diaphoretics still another. Cathartics, however, are more certain in their operation than either of the other class of remedies, though the hydrogogue diuretics, as juniper, broom, digitalis, squills, etc., especially in cardiac dropsy, are often very efficient; and sometimes when they fail to produce the proper effects given by the mouth, fomentations of digitalis over the loins, or a liniment of one part each of tincture of digitalis, tinct. of squills, and tinct. of iodine, with two parts of soap liniment, applied freely to the abdomen and thighs with friction, will produce more diuretic effects.

The jaborandi, or its active principle pilocarpin, generally operates very powerfully as a diaphoretic, carrying off large quantities of fluid, and, in cases of acute renal dropsy, is frequently an exceedingly efficient remedy.

The more particular treatment of dropsy as a symptom of different forms of disease, will be described in connection with the diseases in which it occurs.

GOUT.—PODAGRA.

Gout and rheumatism are often associated together by writers as allied affections, and placed as local diseases under the head of diseases of the locomotor apparatus. They, however, affect other parts than those connected with locomotion, and depend upon conditions of the blood and of the assimilative processes, which are general rather than local in their seat and character, entitling them to be classed with the general rather than the local diseases. Though these two affections have features resembling each other, they differ markedly in other respects, in cause, pathology, and phenomena, and require a separate consideration.

Gout, a common disease in England, but comparatively rare in this country, and particularly so in the West, is divided by some authors into regular and irregular varieties.

Regular gout has been defined a specific form of articular inflammation, invariably accompanied with uric acid in the blood and the deposit of urate of soda in the tissues.

Irregular gout is the same specific inflammation in non-articular tissues, or a disturbance of the functions of various organs, as the stomach, heart, etc., accompanied with the same abnormal state of the blood, and the same general diathesis of the system. Gout is also divided into entonic and atonic, or sthenic and asthenic, and the terms retrocedent and misplaced are applied to irregular cases where other parts than the joints are either secondarily or primarily affected.

Regular gout, as already indicated, attacks a joint—the smaller joints usually—and there remains until the attack abates, the constitutional symptoms corresponding with the amount of local trouble, and disappearing as the local manifestation disappears. Retrocedent gout is where the inflammation and pain leave the external part and involve internal organs; while misplaced gout is where the gouty inflammation affects internal organs from the beginning of the attack, producing various changes of function, sometimes of a very severe character. Entonic or sthenic gout is where the local inflammation is attended by fever, and increased force of vascular action. Atonic or asthenic, is where the force of action is below the natural standard, where there is less pain and inflammation of the joint and neighboring parts, but yet a large degree, often, of general disturbance, depression, and danger.

A paroxysm of regular gout usually begins with a swelling of the ball of the great toe, which becomes exceedingly tender, red, glossy, painful, and tense; the vessels are all filled, the arteries throbbing, and the part hot. The pain extends up the foot, motion of the part becomes difficult or impossible, and the patient is confined to his couch or his chair. There is a feeling of weakness and numbness of the part, as well as of pain. A feverish excitement accompanies these acute attacks; there is general elevation of temperature, thirst, loss or impairment of appetite, a rapid pulse, furred tongue, etc.; and these symptoms bear a close relation to the number of joints implicated, and to the intensity of the inflammation. The fever thus appears to be secondary, and dependent upon the inflammation of the joints.

Though the pain is usually severe, in exceptional cases it may be slight or nearly absent. Though the small joints, and especially those of the toes, are much the most frequently affected, particularly in the earlier attacks, yet in time the large joints are often involved as well—least frequently, however, the largest—the hips and shoulders.

After a few days the pain, swelling (which is largely œdematous), and fever abate, and before long disappear, without the occurrence of suppuration, and an interval of absence of symptoms is enjoyed—it may be a long one at first, but it is usually shorter afterward, and each succeeding fit is apt to be prolonged. Other joints than those at first affected become involved: the fingers, knuckles, wrists, ankles, knees, etc.; and as the disease progresses and becomes confirmed, deposits take place and permanent irregular enlargements about the joints occur, producing stiffening and even anchylosis.

The kidneys have deposits in them, and are more or less seriously diseased, and the life of the patient is often rendered a burden to himself, and his irritability is apt to make it so to others.

In retrocedent and misplaced gout the symptoms will depend upon the parts attacked. When the brain is involved, there will be nervous and often mental aberrations—pain, delirium, insanity, possibly convulsions, and not unfrequently coma and death.

If the stomach be the seat, there will be gastric distress and great depression. If the lungs, there will be dyspnœa, pain, etc., in the chest; and when the heart is involved, there will be irregular, violent, or feeble pulsations, great distress and anxiety, and not unfrequently asthenia or syncope and death.

Gouty attacks are often preceded by premonitory symptoms, such as derangements of digestion, cardialgia, coated tongue, a "crampy" state of the muscles, palpitation of the heart, asthmatic respiration, nervous irritation and depression, scanty and high-colored urine, etc. In other cases unusually good health and spirits may precede an attack —an apparent physiological excitement, to be followed by an explosion of gouty symptoms.

In this disease the conditions of the blood are changed; and in chronic cases what are called chalk stones are found about the joints, upon the cartilages of the external ear, and elsewhere, consisting of urate of soda; and crystals of this salt are deposited in the articular surfaces of the joints, within or external to the tubuli uriniferi of the kidneys, and the secreting apparatus of these organs is injured. A shriveled, or what has received the name of "gouty kidney," is frequently met with, and Dr. Garrod, whose authority on the subject of gout is of the highest character, is of the opinion that these changes are due to the deposits of urate of soda in their substance. Indeed his investigations tend to show that the presence of urate of soda in the blood and in the tissues accounts for all the phenomena of the different forms of gout. Dr. Gairdner, of Glasgow University, whose opinions are always worthy of consideration, thinks that a state of plethora of the chyloidic organs and a general venous congestion are essential to the formation of the gouty diathesis, and are always present.

Whatever other conditions may be present, there can be no doubt that uric acid and urate of soda in the system play an exceedingly important part in the production of the gouty phenomena. The deposits of urate of soda are particularly liable to take place in parts remote from a current of blood, and hence they are found in the fibrous and cartilaginous structures of the joints. Dr. Garrod states that they are not found in the endocardium, as rheumatic deposits are, because of the proximity of the blood flow; but these deposits take place in the kidneys as often as elsewhere, and the tissue of this organ certainly cannot be regarded as remote from a current of blood.

Etiology.—Some of the causes of gout are dependent on the conditions of the system, and others upon extraneous influences.

There can be no doubt that heredity has a decided effect in the production of gout. Gout in the offspring may not be of the same character as in the parent; and an hereditary gouty tendency may give a coloring and character to rheumatism, neuralgias, and dyspepsias, rendering those affections more responsive to the remedial power of colchicum and other remedies specially useful in gout.

Gout is more frequent in men than in women, and in advanced more than in early life. The extraneous causes producing it are more likely to be present in men than in women, and in middle or advanced life than in youth; and the periodical fluxes of women tend to eliminate injurious materials and reduce plethora. After the menopause women are more subject to gout than before that event.

The chief cause of gout, independent of the peculiarity of the system, is universally considered to be the use of alcoholic beverages. Pure alcohol or distilled spirits have less influence than the mixture of alcohol with other ingredients in wine and beer; but the stronger these articles are in alcohol, the greater is their effect in producing the disease. Says Dr. Garrod, "Alcohol, when in combination with other substances, as in wines and malt liquors, becomes a potent cause of gout, and the greater the amount of spirits contained in such beverages, the more powerful their influence in producing the disease."

It is not known what particular ingredient in the wine imparts to the alcohol the quality of inducing the gout. It seems not to be the acid or the sugar; for, says Garrod, "the wines the least acid and the liquors the least sweet are among the most baleful." An excess of food, *especially animal food*, and this in connection with want of active bodily labor, contributes to the production of this malady. Rich made dishes, and all articles tending to induce indigestion may predispose to gout, and they certainly often derange the stomach and excite an attack in those predisposed to the disease. Indigestion, which causes an increased amount of acidity in the system, aids in the development of gout, causing a less alkaline condition of the blood, and hence favoring the insolubility and deposit of the urate of soda in the tissues; and it may act by promoting the formation of uric acid itself.

Nervous depression and shock tend to bring on attacks, and severe mental labor has a similar effect.

Gout is less prevalent in the hot season than in the cold and temperate, and it abounds more in cold climates than in warm; but it is thought that more depends upon the habits of the people, upon the beverages they use, than upon the climate they inhabit. There is no gout in the central parts of Africa; but neither are there the wines that are believed to cause it in Europe and elsewhere. The poisonous effects of lead are manifested more readily in gouty patients than in others. The common opinion that gout is produced by high living, sluggish bodily habits, and indulgence in wine, is fully sustained by accurate observation.

Diagnosis.—The diagnosis depends upon the character and seat of the local affection and upon the general state and symptoms. Gout has a peculiar preference for small joints, especially for the ball of the great toe, in its first invasion ; and the pain in a decided attack is usually very severe. The attacks are likely to occur at somewhat regular intervals, with periods of comparative exemption ; but when urate of soda is freely deposited in the tissues of the joints, there will be more or less pain, tenderness, and interference with the functions of the parts more constantly. The diseases with which it is most likely to be confounded are *arthritis deformans* or *rheumatoid arthritis*, chronic rheumatism, and in the irregular or misplaced varieties, common inflammation of internal organs. There may also be obscurity in cases of lead poisoning occurring in gouty patients. Indeed these two latter conditions are not unfrequently combined. The poisoning from lead not only occurs more readily in gouty persons, but the lead diminishes the excretion of uric acid and causes its accumulation in the blood, and this it is thought may produce attacks of gout.

Arthritis deformans is steady and progressive in its course—does not come on in paroxysms, occurs among the poorly nourished, and is not accompanied by deposits of urate of soda.

Chronic Rheumatism affects as often the larger joints, and the aponeurotic and muscular tissues ; there is an absence of the acute gouty paroxysms and of the urate of soda deposits.

Misplaced gout occurs in persons subject to the ordinary forms of the disease, and the internal inflammations differ in their phenomena and course from common phlegmasias.

Prognosis.—The prognosis of regular entonic gout is very favorable as to recovery from the attack, but by no means so favorable as to future exemption from the disease. In irregular and atonic gout the prognosis is much more unfavorable ; and where the stomach, the heart, or the brain is affected death may suddenly result.

After one well-marked attack, without treatment or change of habits, the disease is almost sure to return ; and it may be added that its continuance in a chronic form not only renders life miserable, but tends to shorten its duration. If it attacks very young subjects, the prospect is bad—the older the person when the first attack occurs the more favorable. Hereditary cases are less tractable than the acquired. The appearance of chalk stones at the surface, even if confined to the helix of the ear, is an indication of internal deposits of urate of soda, and of a confirmed and obstinate case ; and all gouty persons are liable to suffer more from accidents and exposure than the majority of other persons; and the more the kidneys are implicated the less able are gouty subjects to withstand the effects of shock upon the system.

A single fit of gout, however slight, should be received as a warning that the patient cannot go on with his present mode of life with impunity; but that in most cases with a proper regimen and medicinal treatment he may be saved from the life of increasing suffering which may otherwise be expected.

The Pathological Anatomy of gout will be inferred from what has already been stated of its phenomena. The articular surfaces of the affected joints are found covered with a whitish deposit, consisting of bundles of crystals of urate of soda, usually radiating from a centre. The joints most affected contain the greater amount of this material; and as the disease is more frequent in the smaller joints, these deposits are more marked in them, but are also found in the larger joints, and sometimes in the bones themselves. Thickening of tissues connected with the joints, produced by the inflammatory hyperplasias excited by these deposits and mingling with them, are also found, and in some old cases masses of urate of soda of various sizes are present, constituting the "chalk stone" mentioned. The blood contains urate of soda, and uric acid is frequently present in the perspiration, and in the fluid found in serous cavities.

Of changes in the internal organs the "gouty kidney" is most frequent. The kidneys are small, granular, and fibrous, and crystals of urate of soda are deposited in the tubules and intertubular tissues in such abundance that they may often be seen by the naked eye as white lines through its substance.

Atheromatous and calcareous changes in the coats of the blood-vessels are very common in old gouty subjects.

Treatment.—The treatment of gout is naturally divided into that of the paroxysm of the regular fit; that of management during the interval, with reference to preventing recurrence and removing the gouty habit; and the treatment of the irregular forms and the complications that may occur.

The first question will be as to the necessity of treating a regular fit of gout at all. Some moderate cases will subside in a few days if the patient is careful of his diet; but if he lives in his usual high mode the attack will commonly be prolonged, often for weeks or months, with perhaps slight remissions, until strength and appetite fail, and an altered diet is enforced; the paroxysm will then be exhausted. Dr. Garrod says the disease generally lasts long under infinitesimal doses. As a rule, then, treatment of the fit is useful. Considering the cause of gout and its painful phenomena, the treatment, we would infer, should be eliminative and soothing.

Direct depletion with the lancet is very seldom necessary, and never except to relieve general symptoms. In vigorous *plethoric* subjects it may be useful for that purpose. Leeching near the inflamed part may produce some relief of the local symptoms when the pain is great.

Purgatives in some form, to eliminate accumulations of effete matters, the result of repletion, are generally required; and diuretics and diaphoretics are indicated for the same general purpose.

Opium diminishes some of the secretions, but it allays irritation so much, and relieves pain so decidedly, that, properly combined and timed so as not to check secretions or interfere with elimination, it is at least a great comfort, and is often much more.

Colchicum, however, is the great remedy in gout. It is regarded by many as a specific, and is undoubtedly the most frequently and the most decidedly useful remedy we possess. It sometimes, however, fails.

When given in sufficient doses it acts slowly, but at length efficiently, as a purgative; in the meantime, or in smaller doses, it increases notably the solid constituents of the urine, organic and inorganic, thus effecting elimination; and besides, it has a peculiar effect upon the nervous sensibility directly, and by its sedative and anodyne influence it lessens notably the pain and allays the general symptoms. It is apt to cause nausea, but this is more endurable than the extreme pain, and this unpleasant effect may often be avoided or rendered transient.

The wine of colchicum, prepared from the fresh root, is the best form. As colchicum in the market is chiefly produced in England, and as the root when dried loses much of its virtues, the wine prepared and imported from England is by far the most reliable preparation. Of that prepared in this country the wine of the seed is perhaps best. The strength is apt to vary as ordinarily obtained from the shops. Of a good specimen the dose is from ten to fifteen drops to ʒss. Of some preparations from one to two drachms will be required, and it may be repeated once in from three to eight hours. The active principle, *colchicia*, is said to be preferable to the crude drug. "It may be given advantageously with quinine, morphia, and compound ext. of colocynth." (Bartholow.)

Dr. Garrod gives colchicum in large doses, generally at his first visit. He says it often procures relief from pain very speedily, from its neurotic effect, without or before its eliminative operation. Its action is peculiar. It does eliminate from the kidneys; but it appears also to arrest the formation of uric acid in the system, and this leads to a diminution of urates in the urine. This effect being observed, has led to doubts as to its eliminative action ; but it is generally regarded as having a diuretic as well as a cathartic effect : but whatever the mode of its operation, its relieving effect upon the gouty condition is unquestionable, and its use is strongly indicated. It should generally be continued for some time, or until relief is procured to the pain and the other inflammatory and febrile symptoms.

Some advise purgative doses of the sulphate and carbonate of magnesia with the colchicum, preceded by a blue pill, or by a dose of calomel or podophyllin or colocynth—or by the mercurial in small and repeated doses. Podophyllin combined with soda or euonymin may serve as a substitute for the mercurial, especially where an idiosyncrasy forbids it use. Saline diuretics may accompany or follow the use of the colchicum, thus increasing elimination.

Salicylates have recently been employed in the same manner as in rheumatisms in the acute fits of gout, and the relief from them is said to be quite remarkable.

Locally the painful part may be wrapped in carded cotton and covered completely with oiled silk, thus excluding the air and sudden changes of temperature. Anodyne applications may be made—such as preparations of belladonna and opium, atropia and morphine. As an example, ℞ Atropia, gr. j ; Hydrochlorate of Morphia, grs. viij ; Water and Proof Spirits, āā ℥ss. M. Apply with small pieces of lint, with oil silk over, and surround the whole by cotton batting. Where the swelling is great, and the case acute, leeches in the neighborhood procure relief ; and blisters applied not too near the joint are always safe, often checking the progress of the disease and procuring immediate relief.

The treatment during the interval with reference to avoiding a return, must consist first and chiefly in the correction of those habits which are the cause of the disease. A plain, simple diet, with but spare quantities of animal food must be adopted, and all alcoholics, and especially wine and malt liquors, must be avoided. As some gouty persons are apparently in good health during the interval of the paroxysms, this change of the dietary with them, together with the taking of active exercise—performing bodily work or regular walking, etc.—may be all that will be required.

Others suffer during the interval with various disorders of the digestive functions ; with disturbed rest, irregular action of the heart ; with cough, hemorrhoids, disturbed functions of the brain, irritable temper, giddiness, impaired vision, etc., indicating the morbid condition of the blood and the tissues, the presence of urate of soda and other effete and irritating matters in the system, and changes in the vascular and tissue actions. These symptoms should receive attention and treatment according to their character. The urine should be carefully examined, and its indications observed and followed.

Lithic or uric acid, and the lithates or urates, usually abound. For this state the alkalies are usually recommended, and there can be no question that they are often useful. Potash and soda, or their carbonates or salts with organic acids, are eliminative and chemically corrective of the acidity. A course of gentle saline purgatives, as a few drachms of sulphate of soda early each morning in a free drink of warm water, or some natural saline mineral water, etc., is often useful. As a means of elimination, both by the kidneys and the skin, the free internal use of *water* should not be overlooked. The beneficial effects of the natural mineral waters, saline and alkaline, depend largely upon the free quantity of the water taken; and in ordering salines as eliminatives, they should generally be given in free quantities of water. When large quantities of fluids are taken, they pass out of the system chiefly by the kidneys and skin; and in doing so they carry with them in solution more freely the materials to be removed. In Europe the waters of Vichy, Carlsbad, Wiesbaden, etc., are recommended, and, with the regimen prescribed at the same time, are often very useful. In this country the Vichy and other springs of Saratoga, the alkaline waters of Wisconsin, St. Catherines, Canada, the warm springs of Virginia, and the Hot Springs of Arkansas, and others of similar character, are useful.

Oxalate of lime will sometimes be found in the urine. Then the nitro-hydrochloric acid will be indicated. Indeed, for remedying the lithiasis, this mineral acid, by promoting oxidation in the system, or by effecting some other change, often does more than the alkaline remedies. The latter are more palliative than radical. They neutralize the acidity present, but they may not prevent its production. The mineral acids, on the contrary, while they do not neutralize acidity, tend, by improving digestion and assimilation, to prevent its production.

The salts of lithia have also been advised. They are said to increase the excretion of uric acid, and are thought to promote the solution and removal of urate of soda from the tissues. The citrate of lithia is the form commonly used. The phosphate of soda, and especially the phosphate of soda and ammonia—the latter in doses of ten or fifteen grains three times a day—are likely to be useful.

Laxatives and tonics are in some cases required, and the tinct. of guaiacum combines these qualities, and is often serviceable. Dr.

Harley, of London, whose authority as an investigator and observer is high, affirms that quinine diminishes the production of uric acid in the system, and as its tonic properties are well known, when given in the proper moderate doses, there may be a double indication for its use. Both guaiacum and quinine may be continued a long time, if needed, without harm. In the chronic and atonic varieties, these articles are particularly indicated. Guaiacum may be given for a whole year.

Gout often requires anodynes; and, in cases of great depression, in the misplaced varieties especially, it may require, temporarily, stimulants. In some cases tinct. of opium may be required in large quantities, with ether, chloroform, spts. of lavender, warm brandy and water, ginger tea, etc.

When the internal organs are affected, active counter-irritants and revulsives, such as mustard and hot turpentine applications, may be required; and when there is coldness, external warmth with bottles of hot water may be useful.

In cases of "suppressed" gout, where the gouty poison is affecting the system, spending its force on internal organs, without manifesting the usual external phenomena, the kidneys and skin both being inactive, the heart irritable, and the tissues inclined to take on a low form of inflammatory change; or where more violent symptoms of internal congestion are present, the jaborandi, or its active principle, has already established for itself a reputation. In appropriate doses it first induces a temporary free salivation, soon followed by a profuse sweating and marked relief to the symptoms. Its efficacy is said to be increased by giving in connection large doses of bicarbonate of soda. In chronic cases colchicum, in moderate and carefully regulated doses, often combined with quinine, may be given for a length of time, obtaining its specific effects.

According to Dr. Garrod, in chronic cases, especially where there are nodes, and in neuralgias from inflammations of the coverings of the nerves or thickening of these coverings as the result of gouty inflammation, iodide of potassium has much power. In cases where the neuralgic pains are worse in the warmth of the bed, the iodide is still more efficient. It is also particularly indicated in thickening around joints and in effusions in their cavities. If there be a syphilitic complication, or suspicion of it, the iodide is required in large doses. In the atonic cases, iron, quinine, and other tonics should be combined with the alterative and eliminative treatment, and a more nourishing but still unstimulating diet will be required. When the debility is too great to admit of active exercise, passive motion, frictions, massage, and faradism, may be resorted to. Although these eliminative, alterative, and tonic medicines may be of great service, skillfully administered and properly adapted to each case, yet nothing will avail in removing the gouty condition but correct hygienic habits, and even all will fail where indulgence has gone too far either in the individual or his ancestors. Here, as in so many other cases, the physical sins of the fathers are visited upon the children to the third and fourth generation.

RHEUMATISM.

ACUTE RHEUMATISM.—RHEUMATIC FEVER.—ACUTE ARTICULAR RHEUMATISM.—ACUTE ARTHRITIC RHEUMATISM.

The term rheumatism is often used, even by professional men, in a loose and inexact manner. Acute rheumatism is a sufficiently well-defined disease, but the terms "rheumatism" and "rheumatic" are often applied to nearly all pains which are somewhat more constant than those that are called "neuralgia" and "neuralgic," but which are not accompanied by much constitutional disturbance.

The aches and pains so common in gouty subjects with lithic acid in the blood and lithates of soda in the tissues, are popularly and often professionally called rheumatic. The darting pains of locomotor ataxia, and the periosteal affections of syphilis, are sometimes called by the same name. All myalgias are spoken of as rheumatism, and various arthropathies, sciaticas, and "cricks" in the back have this appellation given to them. The term may be, as stated by Fothergill, a great comfort to those who are diagnostically weak, as it may cover a quantity of ignorance and satisfy the patient; but it often gives a false sense of security in grave affections, and leads to inefficient or wrong methods of treatment. Besides many painful conditions that have no claim to even a remote relationship to true rheumatism, there are several morbid states that have so great a degree of similarity to each other that they are designated as rheumatic by systematic writers. These are:

1. Rheumatic fever, acute inflammatory rheumatism, bearing the different names at the head of this article.

2. Subacute and chronic rheumatism. These forms often follow the acute; but whether so, or whether more chronic from the beginning, they are of a similar pathological character, and depend, doubtless, on the same specific cause.

3. Muscular rheumatism. This, in the present opinion of most pathologists, should not be regarded as true rheumatism, since it differs from it in its essential cause, its phenomena, and its course.

4. Neuralgic rheumatism: is not recognized by all writers as a distinct form of rheumatism, but is regarded as the result of disease and thickening, probably rheumatic, of the fibrous covering of nerves, and consequent irritation and pain, and impaired function in those nerves.

5. Rheumatoid arthritis. Polyarthritis deformans. Nodular rheumatism—formerly rheumatic gout, or synovial rheumatism; now generally regarded, like "muscular rheumatism," as not of the essential character of true rheumatism at all.

6. Gonorrhœal rheumatism, which is also an affection dependent upon another cause, and pathologically distinct from true rheumatism.

Acute rheumatism, or inflammatory rheumatic fever, may be defined a specific inflammation of the white fibrous structures of the body, more frequently those about the joints, attended with great febrile disturbance; the inflammation commonly passing from one locality to another; not, as in gout, accompanied with deposits of urate of soda, and very seldom, if ever, when purely rheumatic, leading to suppuration in the tissues around the joints.

Subacute rheumatism is the same affection as the acute, only manifested in a much less intense degree, with far less febrile disturbance, and generally, though not always, following the acute form of the disease.

Etiology.—Rheumatic inflammation is spontaneous and primary, not depending upon traumatic causes, but upon peculiar conditions of the fluids and solids of the body; and doubtless some poison, developed by malassimilation in the system, is connected with its causation.

Attacks are frequently excited by exposure to cold and dampness, but the disease sometimes comes on when no such exposure has occurred, and may be induced by a variety of causes which produce changes in assimilation and nutrition. While gout appears chiefly among the wealthier classes who indulge in luxurious habits, rheumatism is quite as likely to appear among the poor, especially when they live in low and damp situations. Climate, seasons, and habits of the people have much to do in disposing to the disease. It is more frequent in damp and foggy climates, in temperate rather than in tropical or arctic regions; in the changeable weather of spring and autumn, rather than in the more steady cold or warmth of winter and summer; and it is thought to be more common among a beer-drinking community than in one which abstains from such beverages. The conditions in England are very favorable to its production, and there it is among the most common of diseases. In England, rheumatism is said to be much more prevalent in the eastern than in the western counties, and the difference is attributed to the influence of the north-east winds from the sea, to which the eastern portion of the country is much more exposed.

There are marked differences as to its prevalence in different parts of our own extended country; it is much more frequent, within the sphere of my special observation, in the Eastern States, and particularly in Maine, than in most parts of the West. The rheumatic tendency seems to be transmissible, though heredity has less influence upon it than upon gout. Among the causes connected with the individual, an azotized diet is thought to have some influence, and depressing passions and emotions are reckoned by some as tending to its production. All influences which lessen the force of the organism are considered as aiding causes; and yet the disease sometimes appears in great force in persons of apparently much vigor. Age has an influence in the occurrence of the disease. Where the predisposition is inherited it may manifest itself in early life. Where it is acquired it commonly appears later, oftenest from the twentieth to the twenty-fifth year, and the greater exposure explains its more frequent appearance in men than women. It is not unfrequent, however, in women. Cold acts in two ways in producing attacks; by sudden action, causing in a heated condition of the body a rapid fall of temperature and sudden checking of the secretion of the skin, without being followed in time by proper reaction; and by a slower and more gradual action such as results from living in damp houses. The first condition is likely to precipitate attacks, the other to produce a disposition to the disease. Rheumatism may be regarded as self-propagating, as the occurrences of the disease appear to dispose the system to subsequent attacks; but the relapse does not imply exact similarity in the forms of the successive attacks. Thus, chronic attacks may follow acute ones, and rheumatic inflammation of the heart or other internal organs may succeed to those of the joints.

Morbid Anatomy.—Anatomically the tissues involved are hyperæmic, and during the progress of the disease the fluxion to them is often decided; but structural changes are less than occur in most other forms of inflammation with equal severity of symptoms. Still some hyperplasias occur, particularly in the subacute and chronic forms, and effusions, both serous and plastic, often take place.

Jaccoud gives in substance the following anatomical conditions:

1. The *peri-articular* tissues are not modified, or they are tumid from serous infiltration of the connective tissue.
2. Small subcutaneous ecchymoses occasionally are present.
3. Purulent infiltrations are very exceptional.

4. Tendinous sheaths are often intensely inflamed.

As to the condition of the articular structures themselves:

1. In the first stage there is simple fluxion.

2. The traces of active hyperæmia disappear after death, and the articulation, where the disease does not go beyond the first stage, appears normal. This latter fact, he says, has given rise to wrong conclusions regarding the character of rheumatic inflammation.

3. Though fluxion may disappear, its effects may remain in the form of serous exudates.

4. The presence of flaky, opalescent, turbid liquid is sometimes found in the joint.

5. Besides the albumino-fibrinous débris, leucocytes, which he calls pus, may be present, even when the fluid gives no evidence of them to the naked eye.

6. The synovial membrane is changed, presenting injection and opacity, and its epithelium is broken down; and there are more extensive changes in cases of long standing or of unusual severity. In these more advanced stages the surface of the joint is unequal, hypersarcostic, in consequence of an active proliferating change in the structure, like that present in acute pleurisy.

These lesions form an ascending series, from simple fluxion or hyperæmia to fully developed inflammation. All the joints involved are not affected at the same time, and hence *post mortem* they do not all present the same lesions. The disease passes in its course some joints, leaving them almost untouched, and slightly, yet more markedly affecting others, while others still are attacked more severely, and the disease may inhere in them to the end. Different from gout, the larger joints, those of the knee and shoulder, are those oftenest affected. The tendinous sheaths and the bursæ are often not changed, but they may be inflamed, and their contents may be serum abounding in leucocytes. The cartilages are rarely changed, yet they may be softened and velvety; or their entire substance, in protracted cases, may be destroyed, the ends of the bones being exposed. Such cases must be exceedingly rare, and possibly when they occur another element than the rheumatic has had to do in the case, as Dr. Garrod states that he has not found such conditions, and has had proof that at least a dozen attacks of rheumatic inflammation may occur in a joint without any such change taking place.

The osseous tissue of the epiphyses may be injected, and in rare cases of long standing the medullary tissue is the seat of notable hyperplasia.

In monarticular rheumatism the lesions are the same; but when the whole force of the disease is expended upon one joint the changes are more rapid, and, with the same duration of the disease, the appearances are more advanced. The lesions produced by rheumatic inflammation, where other organs than the joints are affected, will be described under the heads of diseases of the particular organs—of the heart, brain, etc.

The *changes in the blood,* as bearing upon the pathology of rheumatism, are of much importance and have long attracted attention, but there is not yet uniformity of statement in regard to all of them. The name, rheumatism, implies that the disease has been considered to be immediately dependent upon some change in the fluids. Though one set of pathologists, among them Cullen, and others of more recent times, regard the solids as essentially in fault, others believe the phenomena to be produced by the presence of some peculiar principle in the blood. It seems to me quite as likely to be in the lymph also; and if a morbid condition of the fluids be the pathological cause of the symptoms, there must be either a substance foreign to the healthy body, or a modification or increase of some natural ingredient.

Dr. Prout was the author of the suggestion that lactic acid was the morbid principle, and this has been a common view in the profession. Dr. B. W. Richardson, whose activity in endeavoring to advance medical science is so well known, has given some support to this view by injecting lactic acid into the peritoneal cavity of dogs, and thereby producing peri- and endo-carditis, but the joints of the animals were not affected; a longer series of experiments, with other substances as well as with lactic acid, is needed to establish the doctrine that the peculiar phenomena of rheumatism are produced by this substance.

Some have supposed the symptoms to be produced by uric acid, though in smaller quantities than are necessary to cause those of gout.

That there is an acid condition of the system in rheumatism must be admitted, as the urine, the perspiration, and the fluids of the body generally show diminished alkalinity or positive extra-acidity; but it is not proved that such acidity is the particular and only cause of the phenomena of the disease, and it is exceedingly probable that there is some other specific material concerned in their production which has not yet been isolated and distinguished. As attacks are so often supposed to be produced by exposure to cold, it has been thought that retained excretions from the skin exert a causative influence.

There are, however, certain changes in the blood in rheumatic fever and inflammation that are perceptible, whatever relations they may bear to the disease, either as causes or consequences. As given by Jaccoud they are:

1. Excess of uric acid and lactic acid.
2. Great increase of fibrine—to several times its normal amount.
3. Increased coagulability—inopexia.
4. Diminished density of the serum, and decrease of albumen and of the blood corpuscles both white and red.
5. Increase of extractive matters, of fat and of cholesterine.
6. The greater the number of joints affected, the more marked will be the diminution in the albumen and the globules of the blood. These impoverishing processes produce the rheumatic anæmia.
7. The hæmatopoietic function of the connective tissues in the diseased parts is destroyed.
8. When rheumatic patients die with brain symptoms, without distinguishable lesions, the blood has other characters. There is an abnormal fluidity, it stains by infiltration the endocardium, and there is an increase in the quantity of urea.

Autopsies in cases of rheumatism, chronic from the beginning and without severe general symptoms, have been rare, and the anatomical lesions are less understood.

In the variety which attacks a single joint, and occasionally one other, with but mild symptoms, there are probably no decided lesions. In the more intense variety, with recognized lesions during life, there is swelling of the synovial membrane and the ligaments, hypertrophy, and at times fatty degeneration of the articular soft tissues, erosion of the cartilages, in some cases inflammation of the epiphyses, and hyperplasia of the medullary tissue. (Husse.)

Chronic monarthritis, not rheumatic, leads to more profound disorders, often to fungous arthritis and white swellings. In cases where disease is confined to a single joint, there is a probability that the inflammation is not purely rheumatic, and varieties of lesions may take place.

Symptoms and Course.—The symptoms and progress of acute rheumatism are not always the same, and the mode of invasion varies. Sometimes there are vague muscular and articular pains preceding for a day or so the more severe symptoms. In other cases there are more severe pains at the beginning, soon followed by a chill and the rheumatic fever. In still other cases, the local articular symptoms are *preceded* by laryngo-bronchial catarrh, or pleurisy, or pericarditis, etc., conditions which ordinarily appear during the progress of rheumatism, when they are manifested at all with it.

But however it begins, rheumatic fever is characterized by symptoms of an acute nature both general and local. There is an active attack of fever, accompanied by an excited, bounding pulse, a furred tongue, loaded urine, commonly with urates, colored often with pur-

purine—especially when the disease becomes extended and the pericardium is involved;—there is profuse perspiration, often coming on quite early, which has a decided acid reaction and a sour smell. These general symptoms are in the early stages often accompanied by wandering pains; but soon these pains seize upon one or more of the larger joints, which become hot, red, and swollen, and exquisitely tender on pressure or from motion. The tumefaction is variable in amount, and there is no fixed relation between the violence of the pain and the degree of swelling. The skin, though commonly showing a blush, and sometimes a deep erythematous redness, especially when the smaller joints are affected, may be of the natural color, particularly when the large joints are the seat of the disease.

When the swelling and pain extend beyond the joints, it usually denotes the participation of the tendinous sheaths, or the fascia, or sometimes the fibrous structure in the muscles. Sometimes nodosities appear, due to hyperplasia of connective-tissue elements.

Unlike inflammation of the joints from other causes of a local character, this rheumatic inflammation shifts its location repeatedly in many cases, and often rapidly from joint to joint. The amount of early swelling depends much upon the extension of the inflammation to the areolar tissue, and the amount of serous effusion into it. In some cases the inflammation is confined to the deeper parts, when there may be little or no redness, and the swelling will be only of the deeper tissues and more circumscribed. It may be confined to the capsular ligament, producing swelling only by causing effusion into the synovial cavity. In most instances the two varieties of swelling, the deep and superficial, are combined, and the more the deep tissues are involved the more obstinate the local disease is likely to be.

The rheumatic fever is accompanied by a rapid occurrence of anæmia, and its severity and consequences are commonly in proportion to the number of parts affected.

This disease may run its course from first to last without the implication of any internal organ; but not unfrequently—and this gives rheumatism its greatest interest and danger—the disease attacks the investing or the lining membrane of the heart, the envelopes of the lungs, or those of the brain. Of the internal organs the heart is most frequently the seat of rheumatic inflammation—the pericardium, the endocardium, or the fibrous envelopes of the bands of muscular tissue may be affected. Formerly the involvement of internal organs was spoken of as a metastasis of the disease from the joints. It is no more a metastasis than the involvement of one joint after another, and the disease by no means necessarily disappears from the joints when other parts are involved. When the inflammation seizes the internal organs it is of the same character, and depends upon the same causes, as the inflammation of the joints; but from the continued motion of the heart and its peculiar structure, the disease, when located in this organ, is modified in its continuance and results. Serous effusions into the pericardium, or plastic adhesion of its folds, or, more rarely, suppuration of its surfaces, may take place. The endocardium, when involved, is swollen and roughened; exudates of plastic matter are likely to take place upon its surface or within its substance; proliferation, as in other tissues, may occur; and as the most frequent seat of these changes is at the openings involving the valves, their functions are in danger of being seriously interfered with, and the contractions which follow are apt to be finally disastrous in their consequences. These will hereafter be described. The danger of cardiac complications is much influenced by the age of the patient, and the younger the patient the greater is this danger. Such complications are more likely to occur in delicate and impressible girls than in less susceptible boys.

The particular character of rheumatic fever varies in different cases, and its phenomena are worthy of more special notice. The temperature varies, but is generally not as high as in scarlet fever or some of the other infectious diseases, varying from 102° to 104°. In exceptional cases, however, it is excessive, going up to 106°, 107°, and even to 110° or higher. In such cases there is the utmost danger, and its speedy reduction is imperatively called for. There is commonly a free cutaneous circulation, but in protracted cases and when there is profuse sweating, the skin is sometimes pallid from the anæmia and the blanching sweats. The quantity of urine is commonly small, in consequence of the fluid passing so freely from the skin, and a free sediment, consisting of urates and uric acid crystals mostly, is deposited on cooling. There is thirst, owing chiefly to the loss of water by diaphoresis, and constipation is apt to be present. Sudamina in many cases, and sometimes other cutaneous eruptions occur. This fever lasts while the active stage of the inflammation continues, which period, when uninfluenced by treatment, varies very much. As has been shown by Dr. Flint and others, some cases may spontaneously convalesce in a week or ten days, while others continue all the way up to six or eight weeks, and others still become chronic and go on indefinitely. When other parts than the joints are involved, the fever is likely to continue longer than when the joints alone are affected.

Prognosis.—The prognosis as to life when the disease is confined to the articulations, is very favorable, and yet fatal results from various causes may occur.

Death may occur from feebleness of the heart's action united with the increased quantity of fibrine in the blood and its greater coagulability, causing the formation of heart clots.

Death may also result from rheumatic inflammation of the heart, the pleura, the peritoneum, the lungs, or the cerebral and spinal membranes.

Cerebral symptoms rapidly followed by death sometimes occur, and may be caused by cerebral emboli, punctiform hemorrhages, or serous effusions. Hyperpyrexia may be a cause of death; the functions of vital organs, particularly of the brain and heart, being suspended by the direct effect of the extreme heat.

The symptoms in rheumatism are often remitting, and relapses after partial convalescence are apt to occur. The natural termination is by lysis rather than crisis, and while its duration is not confined to any definite period, its mode of termination is not fixed.

The inflamed joints may recover completely, which is usually the case when the disease is not of long continuance. When material structural changes occur, stiffening of the joints, enlargements and slight deformities are likely to be left; and a greater liability to attacks of the disease is always the consequence of even a single occurrence.

A synovial inflammation of a single joint, with but little fever, and that at the beginning, with effusion of serum into the capsular ligament, occasionally takes place, but can scarcely be regarded as rheumatic. However, genuine rheumatism may affect a single joint. The distinction must be made by considering the general conditions, as well as the peculiarity of the local change.

The *subacute* varieties are those slower and milder forms which follow the acute, and need not be particularly described. They consist essentially of the conditions already described or intimated, and the phenomena not specially pointed out can be readily inferred from what has been stated. In cases subacute or becoming chronic, there is much less fever and general disturbance, and the local pain is not so severe. There is often, however, great difficulty of movement and decided tenderness on pressure, with some heat of the part, and sometimes a slight general fever. In these cases the heart is apt to suffer; sometimes the affection comes on insidiously—serious organic changes occurring before the patient is aware of material trouble.

Diagnosis.—A well-marked case of acute rheumatism can scarcely be mistaken for any other disease; still it may be confounded with periostitis, with acute or chronic synovitis, the hysterical joint, and with sciatica or lumbago. Some cases of pyæmia, of blood poisoning after measles or scarlatina, and occasionally cases of cerebral or spinal meningitis resemble acute rheumatism; and rheumatoid arthritis, some cases of gout, and some of neuralgia may be mistaken for different forms of rheumatism. A proper comparison of the symptoms and course of each of the affections will lead to a differential diagnosis, but such comparison need not here be made.

Treatment.—A disease so long known and of so common occurrence, continuing through so many epochs of professional opinion and varieties of practice, and withal a disease so often obstinate and protracted, we should naturally suppose would have been subjected to a great variety of treatment, and this we find to have been the case. In the bleeding days of the past, this form of inflammation was thoroughly subjected to the ordeal of blood; but before confidence was impaired in the power of the lancet over inflammations in general, many had discovered from experience that rheumatic inflammation was but little influenced in its continuance by blood-letting. It is now generally conceded that it not only fails to cure the disease, but when freely practiced, or indeed practiced to any considerable extent, except in the most robust and vigorous, it is harmful, and often markedly so, increasing irritability, and causing the poison to operate with more force, while lessening the power of endurance. It is thought that in the debility induced by it, the heart is more likely to become involved, and that all the dangers are increased. Yet in positive plethora there can be no serious objection to reducing the amount of blood to the normal standard. And when general symptoms, such as arise from congestion of the brain or lungs in an over-full system, require it, bleeding may be practiced with decided relief. It, however, should be remembered that blood impoverishment goes on rapidly during the continuance of the disease, and, as a rule, venesection is contraindicated.

Cathartics have been much used, and are often useful, as in other cases of fever and inflammation, where it is desirable to remove from the system effete matters so abundantly produced, and to prevent fæcal accumulations.

An occasional blue pill, followed by Rochelle salts, makes an excellent eliminative cathartic; and the Rochelle salts, which are composed of an organic acid with the bases, produce the effect of an alkali upon the blood and urine. Though active purgation is seldom required, and the spanæmic effects of mercury are injurious, these articles, when used moderately and cautiously, may be of decided service in modifying the secretions and effecting elimination; and at all events the bowels should be kept open and the tendency to constipation overcome.

In my judgment it is too much the custom of the present day to neglect the use of cathartic medicines and other eliminatives in many forms of disease. Here, as in so many other cases, they not only eliminate effete matters from the system by the alimentary canal and associated organs, but they also moderate the intensity of febrile action, and often drive it from organs which are oppressed. They often also produce in these cases an alterative effect upon the digestive organs and functions, tending to correct that faulty digestion and assimilation, upon which the production of the poison of rheumatism probably depends.

Mercury, to the extent of producing its constitutional effects, has been advised and used; but there is no sufficient evidence that it shortens the course of the disease, mitigates its violence, or prevents its complications; and in such quantities it often does harm to the system. It should therefore be discarded except in such quantities as may excite the secretions and aid in elimination without producing anæmia. When given, it should as a rule be followed by some article to secure its cathartic effect. Given under these restrictions it is often useful as an eliminative cholagogue and cathartic. Laennec, and others before and since his time, even down to Jaccoud, recommend tartrate of antimony; some advise it in free contrastimulant doses as the chief reliance, especially in robust patients. Jaccoud declares it abridges the attack. In England and this country its use in this manner is generally, if not universally, abandoned; and whatever its virtues, it has powerfully depressing and irritating effects, and, to say the least, we have better agents. I am not prepared to deny that in the more sthenic forms of the disease, with a hot and dry skin, and especially when there are pneumonic complications, it may serve a useful purpose as a sedative, diaphoretic, and spanæmic, tending to prevent fibrous deposits.

Veratrum viride has been recommended in a similar class of cases to that just indicated, and it may have its range of applicability, especially when the heart is involved or threatened, when its irritability is great, and before its strength is impaired. The drug is sedative, diaphoretic, and eliminative, and at one time was a decided favorite. It must be used with care, and should be abandoned when the heart's power flags.

Opium is another article which has been recommended as the chief reliance, not only for allaying pain, diminishing suffering, and procuring rest, but as the chief and almost exclusive curative agent. It was recommended in full medicinally narcotic doses, to be kept up until the disease yielded. Although its use in this manner is not now so much relied upon, it is an exceedingly useful article in connection with other treatment, not only affording great relief from pain and procuring rest, but overcoming irritability and aiding in subduing the inflammation.

Quinine has also been recommended as the chief agent in the treatment of rheumatism, given in large and repeated doses, to secure its antipyretic and antiphlogistic effects, and continued until the disease is overcome. At one time it was used by M. Briquet and other French physicians in full sedative doses, as high as seventy-five grains in twenty-four hours, and continued as long as the pain and fever lasted. It was alleged that accidents followed its use, such as congestion of the brain and alarming depression; and in Paris it has fallen into comparative disuse in these large doses. Still, Drs. Garrod, Niemeyer, and others contend for its great utility in doses sufficient to quiet the febrile symptoms, even to the extent, sometimes, of disturbing the brain and stomach. Some would use it in very large doses, so as to procure at once its antipyretic effects, and then not repeat it for twenty-four or forty-eight hours. Dr. Garrod combines it with alkalies. Combined with opium, or even alone, I do not doubt its great efficacy, and were there not another article still more efficient but operating similarly, it should, in my judgment, be particularly recommended. Whenever a malarious influence is present it should without hesitation be given in full antiperiodic doses.

Colchicum was a remedy often relied upon when the distinction between rheumatism and gout was not so clearly made as now. As an eliminative and purgative, and an agent for diminishing the formation of uric acid in the system, it may be useful; but it has not such a specific effect upon rheumatism as it has upon gout. In some rheumatoid affections it has, however, much efficacy; and in pure rheumatism, especially in some of the sthenic forms, and in patients not very impressible and with good powers of endurance, it is not unfrequently useful. In combination with alkalies and other remedies it is thought to have the effect to increase their efficacy.

In this country some years ago, the *cimicifuga racemosa*, or black cohosh, had a reputation and a run, especially in subacute cases; but it has not sustained the reputation which it at one time obtained.

Stramonium has a reputation, especially in those forms of subacute or chronic rheumatism where a neuralgic element is prominent. I think it capable of doing good, in combination with other remedies, in cases of this kind.

Guaiacum has long been used in chronic cases of rheumatism accompanied with exhaustion and debility. It is a diaphoretic and stimulant, and often improves the tone of the stomach. In sufficient doses it will act as a laxative and diuretic. Its virtues depend upon its eliminative and stimulating action.

The nitrate of potash has been extensively used in the acute forms of this disease. It has been given in doses of from a few grains to several drachms, or an ounce or more, in twenty-four hours. It is very apt to irritate the stomach in the larger doses, and the smaller ones cannot be relied upon to produce much effect. It, however, tends to diminish fibrine, and may have an influence in warding off embolism and internal complications. But its efficacy is not so striking as to be unequivocal.

Lemon juice was strongly recommended, some years ago, by Dr. Reese, of London, as a cure for acute rheumatism. It was supposed that its excess of oxygen converted the lithic acid into urea and carbonic acid, while its small quantity of the alkaline base aided in the curative effect. It had the virtue of novelty and simplicity, and of not being unpleasant to take, as well as the advantage of a plausible theory respecting its beneficial action, and it had a fashionable run. Its good effects are at least uncertain, and it has not sustained its reputation. In the form of lemonade it is a pleasant drink and useful diluent, and may be allowed to a rheumatic patient if it does not disagree with the stomach.

Various other particular articles might be mentioned which have had their advocates, but which have failed to establish a general reputation, and none of those mentioned can be regarded as approaching to specifics, and most of them are of doubtful efficacy in the treatment of the disease.

The alkaline treatment of rheumatism, brought forward several years ago, more particularly by Dr. Fuller, has sustained its reputation longer than any of its predecessors, and there can be little doubt that it has decided virtues.

Dr. Fuller says: "Of the value of alkalies and their salts in acute rheumatism, it is impossible to speak too highly;" and when we consider that in this disease the whole system seems surcharged with acid —the acidity of the urine being doubled, the perspiration intensely acid, and the saliva losing its normal alkalinity, while the alvine discharges are loaded with acidity—and further considering the influence which alkalies and their salts have in preventing fibrinous deposits so liable to take place, we are easily led to believe that these remedies are useful. They certainly neutralize the acid to the extent of their chemical capacity, they depurate the blood by increasing secretions, and they tend to prevent fibrinous coagulation and deposits.

Whether the presence of this acidity is the cause of all the symptoms or not, there can be little doubt that it at least contributes to their production; and so far as it can be neutralized, palliation at least must result. Long experience has abundantly sustained these rational conclusions. The alkaline treatment may not be the most efficient—it indeed is not—and it may not be entirely curative, but it can scarcely fail to be at least palliative.

It consists in administering the alkalies, their carbonates, or their salts, with organic acids, in sufficient quantity, if the stomach will bear them, to neutralize the morbid acidity of the system; the test of which will be the neutral, or better, the alkaline reaction of the urine.

The carbonates of the alkalies or their salts, with organic acids, such as the acetates, the citrates, and the tartrates, can be borne by the stomach in much larger doses than the pure alkalies; and taken into the circulation the organic acids are separated and decomposed, and the bases are left to produce their alkaline effect.

The acetate, or bicarbonate, or citrate of potash, or the sodæ et potassæ tartras (Rochelle salts) are the forms commonly used.

Dr. Dickinson, of London, contends that ten to twelve drachms of a mixture of the acetate and bicarbonate of potash should be given in the twenty-four hours in order to secure the best and most reliable results. As a specimen prescription:

℞	Acetate of Potash..................	ʒss
	Bicarb. of Potash..................	ʒj–ʒjss
	Nitrate of Potash	grs x
	M.	

To be given in free solution once in four hours; or half the dose once in two hours.

All stomachs will not bear as much; but when the alkali is given and borne to this extent the system will soon be saturated with it, and the urine will lose its acidity. The effect of this treatment in abating the severity, cutting short the duration, and preventing the extension of the disease to internal organs is unquestionably decided. Not that it is invariably successful in accomplishing all these objects; but that it tends to their accomplishment, and often results in it, seems certain. In the prescription given the nitrate of potash may be omitted, or other modifications may be made, according to the condition of the patient, and the judgment of the physician; but persistence in the use of this or similar prescriptions sufficient to induce alkalinity of the urine, and to keep it alkaline until the disease subsides, constitutes what is known as the alkaline treatment of this disease.

Other special indications may be fulfilled at the same time. The bowels may be moved if required, and for this purpose the Rochelle salts, as answering a double indication, should be preferred. An opiate may be given from time to time as required, and tinct. of chloride of iron may be given in debilitated cases, and a suitable regimen adopted; and this course is not incompatible with any local treatment that may be thought advisable.

Trousseau's treatment with what he calls "Syrup of Lime," is a modification of the ordinary alkaline treatment. His prescription was:

℞ Caustic Lime	℥ij
White Sugar	℥viij

Mix in a mortar and pour over it a pint of boiling water. After, add enough boiling water to make a pint, supplying the amount absorbed. This was to be filtered, and the dose was from ten to forty-five drops once in from two to four or six hours, given in milk. Others have recommended it highly; but it does not cause the urine to be alkaline, and it has never come into very general use.

Dr. Garrod says that for years past he has made use of what he calls the quino-alkaline treatment, and regards it with great favor. Sulph. quinine is ordered to be rubbed up with a solution of bicarbonate of potash, to which a little mucilage and some aromatic, as tinct. of cardamom, or spts. of chloroform are added, so that each ℥jss dose will contain five grains of quinine and half a drachm of the potash—the quinine being reduced to a carbonate. This quantity is given to an adult every four hours until the symptoms have completely abated. He says it does not increase the thirst or the fur of the tongue; and while lowering the pulsations of the heart in frequency, it does not weaken them. The involvement of the heart does not contraindicate its use, though when this is the case leeching and blistering over the part may be made use of. The treatment recommended by M. Jaccoud, in the edition of his work on Practice of Medicine for 1879, in robust patients, when the temperature is beyond 103° F., is tartar emetic in large doses. Bringing the patient under its full influence every third day, he declares, abridges the attack.

In cases of medium intensity, if the patient be robust, a single dose will be sufficient. If the patient be feeble, he advises quinine in large doses, together with digitalis, and with lemonade for drink, and that the joints be wrapped up.

In debilitated cases he advises local treatment and the giving of wine and quinine. In subacute cases he advises the alkaline treatment, with blisters; and in all cases, hypodermic injections of morphine to allay pain. When brain symptoms occur, with high fever, he uses the cold bath and cold affusions.

When single joints are affected, counter-irritation and iodide of potassium, with sulphur baths—and later, passive motion to restore the movements; and in the chronic cases, besides care to protect against cold and moisture, even when pain is absent, he advises iodide of potassium in large doses, and vapor baths, etc.; and when the uric acid dyscrasia is present, the alkaline waters of Vichy, Carlsbad, and Ems, sulphur waters, thermal treatment, hydropathy, cold affusions, Russian baths, baths with vapor of turpentine, and a winter's residence in a warm dry climate are the means recommended.

The treatment in acute rheumatism which for many years I pursued, with results which in the state of our knowledge at that time were to me very satisfactory, was substantially as follows:

If seeing a patient soon after the attack suffering with much pain, a large Dover's powder, or one fourth or one third of a grain of morphine and a grain or more of ipecac. and a few grains of blue mass were given, and repeated once or twice at intervals of four or six hours. This was followed by a free dose of Rochelle salts, repeated if necessary, to secure a cathartic effect, and this was again followed by something like the following prescription:

℞	Acetate of Potash....................	℥j
	Carbonate of Potash..................	ʒiij
	Wine of Colchicum....................	ʒij–ʒjv
	Camphor Water........................	℥ij
	M.	

A tea-spoonful once in from two to four or six hours; reducing the colchicum if much purging was produced, and increasing it if necessary to produce a loose state of the bowels. An opiate was given as might be necessary, to allay pain and procure rest. When the local symptoms were severe, in addition to this the joints were first covered with a loose cloth or sheet of patent lint, saturated in a solution of carb. of potash, an ounce to a pint of water, generally tepid. Oiled silk or gutta-percha cloth was carefully placed over this to prevent evaporation, and the whole enveloped in a large covering of cotton batting to keep the temperature of the part uniform. The alkaline wash was renewed from time to time, and the patient kept as quiet as possible in bed, wrapped in flannel blankets.

Active symptoms were almost invariably removed in a very few days—as soon generally as the urine became alkaline; but if tenderness and swelling lingered in the joints, blisters were applied at a little distance, and sometimes repeated after the manner of Dr. Herbert Davies, of London, though not quite as vigorously as he advises. This treatment was very satisfactory, and would have been continued if, in the advancement of the art, something better had not been presented.

Since the anti-rheumatic virtues of salicylic acid have been known, the ordinary treatment I now pursue is as follows: I prefer at the beginning a cathartic, as I think the after-treatment will then be better borne both by the stomach and the brain. I then commence with a scruple, sometimes more and sometimes less, of salicylic acid and one fourth of a grain of morphine in a capsule, followed very soon by a scruple or half a drachm, more or less, of the bicarbonate of soda in a free drink of water. I repeat the acid and the soda, omitting the morphine—or repeating it only as may be required to keep up an anodyne effect, and to modify, as it is capable of doing, the possibly irritating effect of the acid—but repeating the salicylic acid and soda once in from two to four hours, until the temperature, pulse, and pain are reduced, and the active symptoms disappear. This generally requires not more than two or three drachms of the acid; and that quantity, so far as my experience will enable me to judge, can be borne without any specially unpleasant effects. It should, after this effect, be continued in more moderate doses for a time; and I think it well to give alkalies for some days, almost as vigorously as where they alone are relied upon to effect the cure. Without the continuance of the alkalies relapses not very unfrequently occur, but with them they appear to be very rare. Of the very great—almost specific—efficacy of this treatment of rheumatism, my observation has thoroughly convinced me.

The salicylate of soda is, perhaps, the more frequent form in which it is now given, but the above described mode of administration has been found efficient and satisfactory. If the medicine be preferred in solution, the following formula will afford an eligible preparation:

℞	Salicylic Acid........................	ʒjvss
	Bicarb. Soda.........................	ʒiij
	Glycerine and Pure Water, of each......	℥iij
	M.	

Of this, one thirteenth part will contain about a scruple of the acid, the dose usually given. Another formula is:

℞	Salicylic Acid	℈j
	Carb. of Ammonia	grs. v
	Bicarb. of Soda	grs. v
	M.	

To be taken in solution or in a capsule.

Larger proportionate doses than these of the salicylate of soda may be given and well borne, and, in severe cases, where the fever and pain do not readily yield, doses of a drachm, or even more, of the salicylate may be given, repeated as required to procure relief. In cases of much debility the tinct. of chloride of iron in free doses may follow the salicylate.

Various explanations of the great effect of salicylic acid or salicylate of soda in this disease have been attempted, based upon its physiological action. They have not, so far, been particularly satisfactory; but its therapeutic effects are, marked relief of the pain, and a diminution of the fever; in a day or two after its administration the urine becomes abundant, its specific gravity, which before was high from its being loaded with urea, urates, and uric acid, becomes reduced, and the quantity of urea and uric acid are notably diminished. It appears to operate upon the causes producing the abnormal quantities of uric acid, and it is thought that this is done independently of the reduction of the febrile temperature. In acute rheumatism the quantity of urea and uric acid in the urine is greatly increased, and when this process of its rapid production is arrested, either spontaneously or by the salicylate of soda, the symptoms markedly abate.

In cases of chronic articular rheumatism the quantity of urea and uric acid is often, though not usually, rather diminished than increased, and in such cases the salicylate has little or no effect upon the disease. According to the observations made in the Faculty of Paris, the inference seems to be that the salicylate produces its most marked effects by checking the rapid production of urates and increasing the quantity of urine. Possibly by the polyuria, which according to the French observations is induced, some other more specific poisonous material is eliminated from the system. The very profuse sweating, which is the more immediate effect of the drug, may aid in the eliminative process. This diaphoretic effect is sometimes so great as to diminish temporarily and indirectly the flow of urine. Whatever the explanation, the fact is that in acute arthritic rheumatic inflammation and fever we know of no remedy so promptly efficient in arresting its progress as the salicylic acid or its salt with soda. Should it, however, fail in any case, the physician may resort to the other means so fully described.

Should a condition of hyperpyrexia appear, the temperature going up to 107°, 109°, or 111°, as has been known to occur in some rare cases, in addition to the antipyretic medicines, as the salicylic acid and quinine, the cold bath, or, where the means of using it are not available, cold affusions, cold sponging, or the cold pack, must be promptly and efficiently employed.

As already stated, rheumatic inflammation not unfrequently attacks internal organs, particularly the endocardium and pericardium, giving to the disease its chief danger, and justifying the detailed description which has been given. As the heart is specially liable to be affected in children and young persons in whom the disease occurs, great watchfulness should be exercised with them, and in all cases the heart should be carefully examined daily. The symptoms of the heart affection may be obscure, and the physical signs must be observed in order to determine the presence of such lesions. As these fibrous structures are similar to those about the joints, they are subject to the same inflammatory processes, and may be attacked primarily; but generally the attacks occur after the disease commences in the joints, and these cardiac inflammations go on with the articular affection. There is usually pain in the region, a severe sense of oppression and debility, irregular action of the organ, and an increase in the fever when the heart becomes involved. The physical signs are blowing sounds from swelling and roughness of the endocardium, or friction sounds when the pericardium is the seat of the disease. When effusion occurs in the pericardial sack, distance of the sounds of the heart, dullness on percussion over a larger space, and often bulging, may be observed.

When the heart or other internal organ is involved, the anti-rheumatic treatment must be pushed with vigor; and in addition, leeches and blisters are usually applied; and particular symptoms are to be managed according to their indications.

The more particular methods of detecting and treating these and other internal complications will be described in connection with other diseases of the respective organs.

CHRONIC RHEUMATISM.

By chronic rheumatism is understood an affection of the articulations and other fibrous structures, causing pain, especially on motion, with stiffness and some swelling. It is frequently the result of acute attacks; but sometimes, especially after middle life, is chronic from the beginning.

The pain and soreness are usually limited to the articulations and their neighborhood ; the joints are somewhat swollen and the movements restrained ; there is but little redness or heat, except when the inflammation is more acute ; and the symptoms are much influenced by changes of temperature, by humidity of the atmosphere, and by exposures.

Sometimes the joints creak on movement as the sheaths of the tendons become roughened and thickened ; and the difficulty of movement is greater in the morning, and is more or less relieved temporarily by exercise or frictions. There is less migration of the disease from one joint to another than in acute rheumatism, and often the same joint is affected for a long time. Myalgia, or what is called muscular rheumatism, may coincide, and in some cases the same kind of inflammation extends to the sheaths of the muscles. Some cases of this affection are exceedingly chronic and obstinate, lasting not only months, but years, fluctuating more or less in severity, and aggravated by cold, dampness, and exposure.

The pathological changes are the same as those described in the protracted cases, which are the sequel of the acute.

Heredity here, as in acute rheumatism, exerts an influence in causation ; and exposure, working in the water, a damp and changeable climate, and severe exercise act as causes—those joints being most affected which are most used. Depressing influences are also reckoned among the causes.

Diagnosis.—The diseases most resembling chronic rheumatism are, synovitis, neuralgia, myalgia, and rheumatoid arthritis. It is to be distinguished from these conditions by a careful comparison of the phenomena.

The **Prognosis** as to life is favorable, but as to speedy and complete recovery, it is unfavorable. Still, many cases recover, and more or less relief can generally be effected.

Treatment.—The most efficient remedies for acute rheumatism or rheumatic fever have far less effect upon the chronic affection. Colchicum, guaiacum, conium, cohosh, and various other articles formerly held in repute, have lost much of their reputation. The general remedies now held in esteem are iodide of potassium, cod-liver oil, muriate of ammonia, the bromide and lithium salts, arsenic, and saline and sulphurous mineral waters.

Any of the above remedies must be persevered in a long time to produce much effect.

Bartholow speaks highly of the bromide of lithia.

Local remedies are often useful. The method of active friction, movements, and pressure, known as massage, is often useful. Striking cures are sometimes effected by it. A current of galvanic electricity, of large volume but low intensity, will often be useful when systematically applied. Warm baths, steam baths, Turkish or Russian baths, with douches to the parts, have much reputation, and are sometimes, but not always, efficient. After a bath or douche, frictions with cod-liver oil will sometimes be of service. Mud baths are used in some parts of Germany, and, it is said, with good effect.

Many of the cases will try the patience and confidence both of the physician and patient, but continued perseverance will not unfrequently be crowned with good results.

RHEUMATOID ARTHRITIS.

POLYARTHRITIS DEFORMANS.—NODULAR RHEUMATISM.—RHEUMATIC GOUT.—CHRONIC RHEUMATIC ARTHRITIS.

This is a peculiar chronic and obstinate joint affection, resembling, but not identical with, ordinary chronic rheumatism, characterized by irritative outgrowths of the cartilages and synovial fringes of the joints, associated with destructive changes of those parts of the cartilages subjected to most pressure, and by the development of bony and articular lesions, which produce deformities, and often in time immobility of the joints affected.

There are two varieties of this affection: one primary, and gradual in approach and in its course throughout; the other, secondary to acute attacks of ordinary rheumatism, but becoming chronic, though with exacerbations and remissions more marked than in the primary variety. The primary forms of the disease appear at a somewhat later period of life, and are more common than the secondary.

This disease occurs oftener in women than in men, and in damp and cold localities or dwellings, and, unlike gout, is more common with persons in poorer circumstances, and with restricted rather than luxurious modes of living. It is not a disease of modern origin, as bones found among ancient ruins have presented the characteristic deformities of the affection. In some cases observed by Lebert, a uric acid dyscrasia was present; but generally this is not the case, and the pathological cause is not known.

SYMPTOMATIC AND PATHOLOGICAL PHENOMENA.

In the primary form the lesions are often confined to the small joints of the hands and feet, but they sometimes extend to the larger joints, and even to those of the vertebræ. In the secondary variety the larger joints, as well as the smaller, are more likely to be involved, notably those of the elbows and the knees.

In both forms the anatomical lesions are the same.

The morbid changes are chiefly in the articular cartilages and the synovial fringes. The central portions of the cartilages acquire a villose character, and are worn away by degrees, while the margins are irregularly enlarged by hyperplasia. The synovial folds and glands are thickened, and may form circumscribed masses, which may be detached and act as foreign bodies in the joints. These morbid enlargements are at first fibrous, but at length they become cartilaginous, and later in the disease become converted into bone, and a permanent, immovable, anchylosed condition results. The ligaments are thickened and often contracted, the ends of the bones are enlarged, horny growths are projected, certain muscles are permanently contracted, hyperplasia and retraction of neighboring connective tissue occur, especially in the plantar and palmar regions, and the characteristic luxations, subluxations, and deformities result. In the earlier stages soft and liquid exudates take place, but as the disease advances they become dry, hard, and firm.

In the variety secondary to ordinary rheumatism, cardiac lesions may be present, such as pericarditis, arterial atheroma, and enlargement of the organ, but seldom valvular lesions, and in most cases the heart is unaffected.

The symptoms and progress of the two varieties of rheumatoid arthritis are somewhat different. When the disease is secondary to acute rheumatism, the pain, particularly in the small joints, remains after the subsidence of the fever and the symptoms in the large joints, except perhaps in the knees and elbows. When primary, it has a gradual accession, and occasions little or no general symptoms. The pains, however, are decided. They may be rending, lancinating, or contusive, are usually severe, and generally precede the occurrence of any apparent change of structure by some days, or even weeks. The pain is increased by pressure, and in its progress, if not in the beginning, the disease is bilateral, and generally symmetrical. The hands are commonly attacked first, and the feet later; but at length both extremities and a large number of joints become involved. The swelling at first is due to moist exudates and tumefaction of tissues; and when this turgescence abates, it is then due to the enlargements of the cartilages and the heads of the bones.

Contractions of muscles near the joint may be due to reflex action from the pain in the articulation, or from irritation and pain extending to the muscles themselves.

Luxations or subluxations are common when the disease is advanced; the phalanges may be displaced upon one another, the fingers being bent like a roof, while the thumb is free; and the fingers are also bent upon the metacarpus, with the wrist often inclined to the ulnar side. In severe and advanced cases the elbows and knees are involved—deformed and immovable, generally flexed at nearly right angles; and at a latter stage, though the pain and active disease subside, the patient is a helpless cripple. A woman about forty was brought to the University hospital in apparently good general health, and then suffering but little pain. The knees and elbows were at right angles and fixed; the wrists, fingers, and other joints were immovable; the shoulders and hips very slightly movable, and she was consequently unable to stand, to feed or dress herself, and was more helpless than an infant. Another patient, a man, soon afterward was brought in a similar condition. In the first case treatment was judged to be useless, and scarcely anything was advised. In the other case an effort was made for a few weeks by general treatment, iodine applications and electricity, frictions and passive motions, and some impression was made upon the enlargement and immobility of the joints; but he was sent by public charity from a distant part of the State, and as no promise could be given of a cure, he was removed to become an object of permanent support in his own county.

Prognosis.—When the disease is advanced and the joints have become fixed, the prognosis as to cure is exceedingly unfavorable—perhaps it may be said hopeless. In the early stages there is more hope, and effort should be made, but complete success is very rare.

Treatment.—In the treatment one object is to prevent deformity and the fixing of joints in positions of inconvenience and uselessness. Something may be done by keeping the parts in the best positions, the knees and hips so that in case of partial or complete anchylosis the more inconvenient positions may be avoided. Something may perhaps be done by extension and passive motion, to preserve mobility, "and massage may be tried with some hope of benefit." Aside from these precautions the general medicinal treatment will be influenced by the views which may be entertained of the pathology of the disease, and its relations to rheumatism and gout. It is rarely attended with the profuse acid perspirations, the febrile urine, and the visceral complications which belong to acute rheumatism; and it has not the primary attacks in the great toe, the constant deposits of urates of soda, the distinctly intermitting character, and the lithiasis which belong to gout. On the other hand, it is an inflammation of the same structures which are affected in these diseases, and it successively attacks different joints as in rheumatism, and many of its phenomena and results strongly resemble those of the other diseases named. It is difficult to determine its relations to these affections; and experience has not been sufficiently definite in results to determine the best modes of procedure.

At the early stage of the disease, however, treatment has been pursued similar to that for subacute forms of rheumatism. Jaccoud and others recommend iodide of potassium, Fowler's solution, arsenious acid, arsenical and alkaline local baths, applications of tinct. of iodine, general hot baths, baths of the vapor of turpentine, mineral waters, constant currents of electricity, inunctions of parts with mercurial preparations, etc.

Jaccoud advises the following for bathing the affected joints:

℞ Carbonate of Soda .... ℥iij
Arsenite of Soda..............grs. xv–xxx
Water .... ℥xv
M.

The general health should receive attention. Laxatives and tonics, iron, etc., may often be required.

Guaiacum, as in cases of chronic rheumatism and gout, is advised, and every means to improve the general condition of the patient which may be indicated should be used. Various tonics, cod-liver oil, etc., may be of use. Hot fomentations to the parts have been thought to be useful, and Trousseau advised the burying of the joints in sand at a temperature of 140° or 150° F., and keeping them there for an hour or two at a time, three times a day.

Sometimes the progress of the disease is arrested and its effects mostly removed, or it may be confined to a few joints; but the influence of treatment in producing these results has not been accurately ascertained.

MUSCULAR RHEUMATISM.—MYALGIA.

The name Muscular Rheumatism is applied to pains resembling rheumatism, which occur in other situations and in other tissues than the joints—in the muscles, aponeuroses, intermuscular membranes, the sheaths of nerves and vessels, and even in the periosteum. Both the names at the head of this article are inappropriate, as these pains are not confined to the muscles; and the first name is doubly so, since there is no more resemblance between this affection and true rheumatism than there is between many other diseases which are not regarded as having any special relation to each other. Pains situated in musles are properly called myalgias; those in nerves are neuralgias; but custom has not established the use of any name indicative in its etymology of all the pains above designated.

These pains are unaccompanied with fever, or marked general symptoms; but when situated in muscles and their sheaths there is pain on motion, often severe, and the function of the part is impaired.

Myalgias may affect any of the muscles of the body. They are arranged by Valleix into a number of groups, with names according to their location, but they are of the same general character where-ever occurring.

Myalgia may be acute, subacute, or chronic. In the acute cases there are severe, cramp-like, or stitchy pains whenever contraction of the muscle is excited, while there is little or possibly none when the part is at perfect rest. What is called a crick in the back or the neck, is a specimen of this affection. There is usually some tenderness on pressure; though firm and constant pressure, preventing motion, may cause relief.

The acute form of the disease varies in duration from a few hours to a week. In the subacute forms the pains are less severe but more protracted, and these cases may result in a chronic disease continuing for weeks and months. Lumbar myalgia, or lumbago, is the most frequent of these affections, and some persons are particularly liable to attacks, and may not be free from more or less suffering for long periods.

The name "nervous rheumatism" has been applied to cases where no lesions were discoverable, while that of "vascular rheumatism" has been used to designate those cases where slight tumefaction or other structural changes are discoverable.

Fluxion is a condition perhaps existing in all cases, and it may exist alone or may produce serous exudations. Indeed, in the more intense kinds, fibrinous exudations and infiltrations may take place, producing nodosities or hardness and stiffness in the muscles affected.

The neurilemma may be involved in a similar morbid action, causing then pain in the course of the nerves, and various functional disturbances, motor, sensitive, and nutritive.

When the sheaths of vessels are involved, the vessels may be pressed upon, as are the nerves, and from this pressure upon the nerves and vessels paralysis, generally partial, and atrophy may follow.

The acute variety of myalgia attacks a single muscle or a group of muscles, remaining constantly, but with variable degrees of severity, until the attack subsides and the symptoms disappear.

In the chronic form there may be a persistence of the pain and tenderness in one or several muscles, followed by anatomical changes;

and in another chronic variety there are rapid changes of location and fluctuations in the severity of the symptoms.

In the acute variety very little or no anatomical change can be discovered *post mortem*, where death occurs from accidents during its continuance; but this does not prove the absence of hyperæmia during life, and sometimes a degree of tumefaction is discoverable. In the dorso-lumbar region and in the neck there is a forced inclination toward the affected side, producing in the neck torticollis. When the seat is in the intercostal and thoracic muscles, constituting pleurodynia, the respiration will be interfered with, etc.

Treatment.—In acute cases the treatment is chiefly local. Many cases will be decidedly and promptly relieved by external heat, as by heating a smoothing iron to 212° in boiling water and passing it over the part with a cloth intervening, but heating the part as much as the sensations will bear. This may be continued for several minutes at a time, and repeated from time to time. The thermal button, passed rapidly over the part, will also often give speedy relief; or hot fomentations, a vapor bath, a mustard poultice, or a chloroform or some other irritating liniment may be useful. Shampooing is often quite efficient.

In more severe and obstinate cases narcotics and diaphoretics—morphine hypodermically, or a Dover's powder internally—will be useful. In the treatment of the more chronic cases attention must be given to the general health. The bowels and digestive organs should be regulated, and all present pathological conditions removed. One of the most effectual means of relieving some cases is the use of electricity—the constant current, continued and repeated as may be required. Dr. Garrod recommends the acetate of ammonia in large doses, combined with some alkaline salt, as the bicarbonate of potash with iodide of potassium. "The time, however, soon arrives," he adds, "when the use of some medicinal agent, as quinine, which exerts a marked influence on the nervous system is required, and this may be advantageously combined with other remedies. Sometimes large doses of hydrochlorate of ammonia are useful; and in gouty habits colchicum alone, or in combination with other medicines, may be prescribed with much benefit." Probably no one remedy will check the disease in as many cases as the sulph. of quinia in free doses continued for twenty-four hours, so as to obtain its full neurotic and sedative effects. In some of the chronic cases, with sluggish capillary circulation, guaiacum, sassafras, mezereon, witch-hazel, turpentine, or balsams may do much good. Sulphur, as contained in natural waters, and arsenic may be tried in obstinate cases. Sometimes, in cases of even long standing, a few hypodermic injections of morphine or atropine will cause very great improvement. Even the counter-rritant effect of acupuncture will sometimes cause relief. Frictions, electricity, and shampooing are generally useful to relieve the stiffness often left after the pain has subsided. Flannel next the skin, and protection from cold, with proper nourishing diet, are among the hygienic measures required.

Gonorrhœal rheumatism is usually described in connection with the other so-called rheumatic affections; but as it is different in its cause and pathology from genuine rheumatism, it is more appropriately considered in connection with the disease to which it belongs, and is specially treated of in works on surgery.

In some cases of scarlatina and other diseases, poisonous and effete materials are left in the system which produce symptoms resembling rheumatism; but the effects from such causes differ from genuine rheumatism, and should not be confounded with that disease. The phenomena differ in different cases; but they all, as a rule, require eliminative treatment, while soothing and supporting measures may be necessary, adapted to the particular circumstances of each case.

LOCAL DISEASES.

In an exact and positive science, a strictly systematic arrangement and a correct classification of the subjects are important features.

In a complex and inexact science, where some of the facts and principles are unknown or not established, a perfect classification is impossible.

Medicine has not yet attained to the condition of an exact science, and though constantly advancing, must, by its complex nature, linger, it is feared indefinitely, in the long list of the inexact sciences.

As a perfect scientific classification is at present impossible, nothing of this character has here been attempted. A simple plan has been adopted of grouping together those subjects which seem to have most in common, and of following an order in taking up subjects according to their dependencies upon each other. Thus it seemed proper to give attention first to those general facts and principles which are at the foundation of all diseases; then to consider the different elementary pathological states; and lastly, to proceed to the various aggregates of these elements which constitute the different particular diseases.

In dealing with the distinct affections, it seemed to me proper to discuss first those where the whole organism is essentially affected—the so-called general diseases; and next, those where some particular organ or system is the principal seat of the affection—or the so-called local diseases. This arrangement seems natural and appropriate; but yet (and here the imperfection of the classification becomes manifest) no serious disease, which is called local, is confined, either in its current phenomena or its effects, to any one organ or system; and no general disease has its morbid processes so balanced that all parts of the body are affected with equal severity. This most primary division of diseases into general and local is far from resting upon a basis of exact scientific propriety. Scarcely a disease among those general affections already discussed is without some special local lesions; and none, of any importance, that are to be treated of among the local affections, will have their morbid conditions exclusively confined to a single or a few organs. It is not surprising, in the absence of a well-defined line of demarkation, that upon the basis on which the arrangement has proceeded, there should be differences of opinion as to which of some diseases should be called general and which local; and several diseases are placed among the general affections which many, perhaps most, writers place among the local. Thus gout and rheumatism are by most placed among local diseases—diseases affecting the locomotor apparatus; and diabetes is placed among the local diseases—and most absurdly among those of the kidneys. There are some diseases still to be described, such as croupous pneumonia, phthisis, etc., which are very doubtfully placed among the local affections. They, however, have such intimate relations with other diseases of the lungs as to render their consideration in connection with them desirable. In truth, diseases not being special entities, but mere phenomenal deviations from the normal structures and functions, consist, even when most specific, of conditions so variable, and the different parts of the organism are in such intimate sympathy with each other, that precise distinctions cannot always be made, and an accurate and perfectly defined classification is impracticable.

Having described those affections which are best entitled to be considered as "general" diseases, we now come to the consideration of those which are commonly spoken of as "local."

DISEASES OF THE ALIMENTARY CANAL AND DIGESTIVE SYSTEM.

By the alimentary canal is understood the tube lined with a mucous membrane, which commences with the lips and extends to the extremity of the intestinal opening. The digestive system includes this tube and the glands which furnish secretions opening into it, and which furnish elements that aid in the digestive process. The lacteals, which take up certain portions of the food from the intestinal tube, and the veins, which have their origin in the membrane of the stomach and the intestines and carry other elements of the food to the liver, are also parts of the digestive system.

Diseases of the Mouth, though not the most frequent or most important, will be taken first in the order.

The conditions of the mouth, especially of the tongue, often afford important indications as to the general state of the system, and particularly the state of the digestive organs. We look at the tongue, the gums, and the throat in most cases of disease. Their dryness or moisture, the presence or absence of coating of the tongue, the character of the coating, the redness or paleness of the organ, its flabbiness or hardness, its patchy appearance, etc., are matters of importance in diagnosis. There are morbid sensations experienced in the mouth, as unpleasant tastes in perverted secretions, and a sense of dryness in fever. There are eruptions in the mouth in the exanthems, bleeding of the gums and bad odors in scurvy, and the collection of sordes in low forms of disease.

But local affections of the parts may cause pain, soreness, heat, dryness, perverted or profuse secretions, or disturbed tastes. These local conditions may interfere with functions, as mastication, sucking, deglutition, and speech, and even breathing may be interfered with, as the mouth belongs both to the digestive and the respiratory system.

STOMATITIS.

Stomatitis, or inflammation of the mouth, is not unfrequent, and presents several varieties.

Inflammation of the mucous membrane of the mouth is frequently connected with some general disease, of which it is one of the local expressions. In this secondary form it may be caused by scarlatina or measles, or by syphilis or scrofula, and it then becomes a part of the phenomena of those respective diseases.

But besides these, we have as idiopathic affections simple, erythematous or catarrhal, follicular or papillary, vesicular or aphthous, ulcerous or ulcero-membranous, and parasitic stomatitis or thrush.

Simple or erythematous inflammation of the mouth is often produced by local causes, as from irritating teeth, abuse of spices, chewing tobacco, and in children by dentition. It is allied to catarrh of the stomach, and in females may be produced by the conditions of the menstrual epoch.

It commences with hyperæmia, and is followed by moderate infiltration and tumefaction of the mucous membrane, buccal, palatal, etc.

At first there is diminished secretion, and then the secretion is increased both of the surface and the glands.

It may commence in spots and spread, or a larger surface may be simultaneously attacked. The epithelium is changed and often thrown off, and erosions occur. The causes may be local, and this catarrhal condition may be primary, but very frequently the stomach and bowels are primarily disturbed in their secretions and functions, and the stomatitis is secondary.

The inflammation may be more intense in certain follicles or papillæ, constituting the papillary variety. At first there will be little, raised, red spots, hard from obstructed follicles or from slight deposits. Then effusions occur, elevating and soon rupturing the epithelium, leaving small abraded surfaces or ulcers with redness around.

When whitish or whitish-yellow spots appear upon the inside of the lips, cheeks, palate, or tongue, looking like drops of tallow with more or less redness around, occurring often in numbers and sometimes running together, they are called *aphthæ*. These are points of effusive inflammation, corresponding to herpetic vesicles on the skin. The exudates are corpuscular more or less, and may be quite plastic or croupous. Epithelial cells variously altered are mingled with them; they soon exfoliate leaving small ulcers, or at least raw surfaces. The symptoms are pain, smarting, salivation, feverishness, irritation increased by taking food or speaking, etc.

This form of stomatitis, like the simple variety, may occur at any age, but is more common in children and young people. It may be produced by the same local irritants as in the simple erythematous cases. It may also be produced by derangement of digestion, prolonged diarrhœa in children, and by febrile affections in older persons. It is not unfrequent in the puerperal state; and it may, from some extraneous influences, assume an epidemic form, more particularly in the variable weather of spring and fall.

More decided ulcerative processes with a membranous exudate may occur, constituting ulcero-membranous stomatitis. This may occur, exceptionally, from local irritations, in children that are in good condition. Oftener, however, it occurs in those living in low, moist situations, with crowding, and insufficient or improper food. In adults it usually begins on the margins of the gums of the lower incisor teeth, and is called *gingivitis ulcerosa.* The gums are much congested, are spongy, bleed readily, become fungous, and separate from the teeth. In connection with these ulcerative conditions exudates in patches may occur and spread, becoming gray, dark, and pulpy, and, when detached, leaving bleeding surfaces with red, raised margins. There is much pain and soreness, greatly increased by taking anything into the mouth; the neighboring glands are swollen, and the breath is very fetid from the destructive changes in the part and the decomposition of the exudates.

The constitutional symptoms are usually not very severe, though there is depression and slight fever.

This ulcero-membranous stomatitis is sometimes epidemic, especially in hospitals, asylums for children, and in barracks or camps among soldiers, and is supposed to be propagated by contagion. Sporadic cases, however, are not unfrequent.

Somewhat resembling the herpetic or aphthous sore mouth, yet differing from it, is the peculiar affection called muguet, or ***thrush***, or *white mouth.* At first red patches are seen, more diffused than the isolated spots in aphthæ, and upon these white points appear, soon coalescing and forming patches which look like curdled milk, and are rather easily wiped away. This material consists of an abundant accumulation of altered epithelium, some fatty material, and other exudative matter, in which are found sporules of a parasitic fungus called the *Oïdium Albicans.* By some the implanting of this parasitic material is regarded as the primary cause of the disease, while others (Jaccoud, etc.) state that the development of parasites is not primary, but forms the second stage of the disease. Berg, Vogel, and others state that at the onset there is a stomatitis with a painful hyperæmia; that the membrane becomes at first dry, glittering, and hot; the saliva distinctly acid; and that this acidity is the chief condition for the development of the parasitic vegetable. The epithelial cells form rapidly, fall off in some situations and accumulate in others, and in this material the fungoid germs of the air find congenial conditions for their growth, and the white material constituting the characteristic appearance is the result.

It occurs frequently in young infants, without apparent preceding disease, but in adults it is usually an attendant upon severe diseases and low conditions of the system. In the last stages of consumption and in advanced stages of some acute diseases, as adynamical pneumonia, it not unfrequently occurs. It is favored by crowding, bad ventilation, and organic debility. It is said the *Oïdium Albicans* is never developed except on pavement epithelium. When swallowed, the sporules may produce fermentation, irritation, and consequent diarrhœa, but they do not grow upon the membranes of the stomach and intestines covered with cylindrical epithelium. They often extend into the œsophagus, but not into the air-passages beyond the superior vocal chords. When found about the anus, it is not, as is sometimes supposed, an evidence of their development throughout the extent of the alimentary canal.

MERCURIAL STOMATITIS.

A peculiar form of stomatitis results from taking the more active preparations or an excessive quantity of mercury into the system, or from the ordinary mild preparations in moderate quantities being converted into the more active forms by other substances met with in the system.

Some persons, particularly those of a delicate organization, are especially susceptible to the influence of mercury, and are readily salivated by small doses. Children are less liable to salivation than adults, but they are susceptible to the mercurial poisoning from large and repeated doses, and when injuriously affected serious consequences—extensive ulceration or sloughing of the mouth, and other low inflammatory or ulcerative processes—are likely to occur.

Mercurial stomatitis and salivation can usually be distinguished by the history of mercurial exposure. It is ushered in by a metallic taste in the mouth, tenderness and redness of the gums, and sensitiveness of the teeth, and generally by a free salivation. When the jaws are brought together there is a sensation as if the teeth were lengthened. Occasionally the mouth for a time is dry, but the salivary glands are irritated by the mercury, and their secretion is usually very largely increased. The breath is extremely fetid, and the odor is regarded as characteristic; but in gingivitis ulcerosa, and where membranous exudates undergo decomposition, an odor is produced which, though not identical, may be mistaken for that of the mercurial sore mouth. The tongue is sometimes much inflamed and swollen, even to the extent of protruding from the mouth. There are in these severe cases much pain, often sleeplessness and headache, some feverishness, and rarely even delirium; and in exceptional cases, especially in low conditions of the system, extensive ulceration and sloughing of the gums and cheeks may result. In the severe cases emaciation and anæmia, particularly the latter, rapidly follow, many of the blood discs being destroyed by the poison.

This affection is usually followed by recovery, but when much ulceration or sloughing takes place, deformities remain. Anæmia and debility continue for some time, and the patient, for a considerable period at least, is more susceptible than before to a similar effect from exposure to the mercury. From one who has once been severely salivated, mercury must be withheld, or administered with the greatest caution, and only where the necessity is great.

Not only the mouth is made sore, but the salivary glands, besides being excited to increased secretion, are irritated in such a manner as often to become inflamed and swollen.

Diagnosis.—It should be borne in mind, lest a false diagnosis be made and an injustice be done, that the salivary glands may be irritated and inflamed, or ptyalism may be induced, without mercury. With some, iodide of potassium produces that effect; and occasionally copper and antimony, cyanuret of potassium and nitrate of silver have a similar action.

Ptyalism may occur spontaneously in pregnancy and some other conditions. In many of the diseases of the mouth, already described, a profuse salivary secretion is a symptom.

Irritation of the excretory duct of a gland increases the secretion of the gland. The diseases of the mucous membrane of the mouth, by involving the salivary ducts, excite the salivary secretion, and when such increased secretion accompanies an ulcerated condition, or where a membranous exudation undergoes decomposition, a fetid odor is produced, which, with the increased salivation, may easily be mistaken for mercurial ptyalism. An opinion of mercurialization therefore should not be hastily expressed.

Treatment.—The treatment for mercurial stomatitis and salivation, being somewhat peculiar, may be given before describing that which is applicable to other forms of inflammation of the mouth. The indications here are to eliminate the mercury from the system, or neutralize its action, and to soothe the inflammation and suffering it produces; and finally, to restore the blood and strength which have been lost.

To produce elimination and to remove any mercury possibly remaining in the alimentary canal, a purgative—generally a saline—should at once be prescribed. This should be repeated as may be required, and in addition diaphoretics and diuretics will aid in the elimination. In the meantime, or immediately after the operation of the cathartic, the patient should be put upon the chlorate of potash, in doses of from ten to fifteen grains, repeated once in a few hours. This drug seems to have a special influence in counteracting the effect of mercury, both upon the blood and the mouth. Locally, fomentations may be applied to the swollen glands, and various washes to the mouth. Holding for a short time in the mouth some warm water with which a few drops of oil of turpentine have been mingled, and repeating this from time to time, will often increase the flow of saliva and relieve the inflammation and pain. Dry flour of sulphur taken into the mouth often produces relief. When ulceration occurs, touching the ulcerated surfaces with a solution of chloride of zinc, two or three grains to the ounce, or a weaker solution used as a wash, is quite efficient. Various astringents, as alum, tannin, and borax, have been advised, and they may modify beneficially the inflamed or ulcerated tissues; but the salivary secretion should not be directly checked, as it certainly is a source of relief to the inflamed glands, and probably aids in eliminating the mercury.

After the active symptoms have subsided, but not before, the iodide of potassium may be cautiously given, with a view of converting any mercury that may remain in the tissues into active forms and eliminating it from the system. If given while much mercury is still present, and before the active symptoms disappear, they generally will be materially aggravated, as the mercury converted into the active iodide will increase the symptoms while passing out. Administering an ordinary dose of calomel or blue pill at the same time with the use of iodide of potassium would be likely to be followed by severe effects, and is therefore to be avoided.

The irritation of the salivary glands and throat produced by iodide of potassium will soon subside on discontinuing the medicine; but this result will be hastened, and relief obtained, by a saline cathartic, and by fomentations or steaming locally applied. When irritation of these parts from other metals occurs, their elimination should be hastened, and when the irritation has continued long from these or other causes, astringents may be used.

The Treatment of other forms of stomatitis will consist in the first place in removing the causes.

Those causes may be general—acting on the system at large, or local—acting directly upon the mouth. In most cases there is some general condition acting as a cause. Mercury produces its effects by acting through the general system, and not by any local application, and various general derangements find their expression in some of the forms of stomatitis. Age has an influence, as children are more liable to these affections than adults, though they may occur at any period, and not unfrequently in advanced life; and bad hygienic conditions as well as ill health dispose to them.

The exciting causes are local irritations, dentition, diseased teeth, accumulations of tartar, alternation of hot and cold drinks, abuse of spices, chewing tobacco, taking cold, poisons in the blood, contagions, etc. They so frequently depend on derangements of the stomach and bowels that the conditions of those organs require particular attention in treatment. In certain states, with foul matters in the stomach, an emetic may give prompt relief. In other cases, and much more frequently, laxatives, antacids, and alteratives are required. All hygienic conditions will require attention—ventilation, a regulated diet, bathing, etc.—and all sources of local irritation must be removed.

The local treatment should be first soothing when the irritation is acute, and afterward and sometimes early, alterative. Astringents, mild caustics—such as touching the aphthous spots with nitrate of silver or a solution of chloride of zinc—borax, alum, solutions of tannin, or decoctions of various vegetable astringents will be useful.

The *chlorate of potash*, both for local and general use, is a favorite and very efficient remedy. It may be used locally in a saturated solution, and given internally in repeated ordinary doses, adapted to the age and condition of the patient.

In thrush or muguet the parasites must be destroyed. There are various parasiticides, and as these sporules of the oïdium albicans are upon the surface of the mucous membrane, they may be destroyed by local means. The sulphurous acid in solution, of such strength as can be borne, is particularly efficient, and so are solutions of carbolic acid or creosote, salicylic acid, etc.; or various mild astringents, as borax and honey, sage tea and borax, or alum, are frequently successful.

Often the patients are debilitated and require to have the strength sustained by good diet and tonics. Preparations of iron, quinine, and other bitter tonics may be demanded.

Attention to the condition of the stomach must not be neglected, and the treatment should often be begun by the use of alteratives and laxatives, as a little gray powder followed by rhubarb and soda, rhubarb and magnesia, or castor-oil. These or similar articles, with some aromatic, may require repetition. If diarrhœa be present and debilitating, it may require controlling by mild astringents and opiates. The *turpentine emulsion* is often particularly useful, to each dose of which may be added, with advantage, a part of a grain of carbolic acid. Chalk mixtures are favorites with some, but not with me. Lime-water with milk will often be useful. As an astringent and tonic in cases of weakness, anæmia, and irritability of the intestinal membrane, the liquor ferri ternitratis is an excellent preparation.

NOMA.

Sometimes more severe ulceration and sloughing of the mouth occurs, constituting a disease called Cancrum Oris, or Noma. It occurs almost exclusively in children under twelve years of age, and mainly in those from one to five. It appears mostly in low conditions of the system, in anæmia from inanition or other causes, and not unfrequently follows measles and other acute affections.

The gangrene may commence at any one point of the mucous membrane of the cheeks or lips, or at different points at the same time. It perhaps more frequently commences at the reflection of the membrane from the cheeks on the lower jaw. It may begin with a small ulcer, which may be the origin of a superficial slough. Sometimes with hyperæmia there are exudations and swelling of the cheek, and œdematous conditions of the lips and other parts, and in all cases a grayish or black sloughy patch surrounded by an intensely congested and livid circle of tissue appears, coagula form in the vessels, and the slough tends to spread in area and depth, preceded by congestion and infiltration. The cheek, upon the outside, often becomes tense and livid, and sometimes a slough involves the whole thickness of the tissues. The gums may be eaten away, the alveoli necrosed, and if life continues, the teeth and portions of the jaw may exfoliate, and the destructive process may extend to the soft palate, fauces, and tongue. When the cheek is perforated the work of destruction may go on indefinitely till the patient succumbs. The character of the sloughing is like that of moist gangrene elsewhere.

The general symptoms are often less severe than would be supposed. The gangrene may have made considerable progress before attracting much attention ; and often after much extension the pain is trifling and the appetite may be preserved. There is, however, more or less salivation, the discharge being bloody and offensive, and the neighboring glands are swollen. But the pulse rises in frequency and becomes small and feeble ; the surface becomes pale and cold ; drowsiness, and sometimes delirium, comes on ; diarrhœa may set in ; and death from failure of the heart's action occurs. In other cases the progress of the sloughing is checked, and recovery takes place, with more or less deformity, contraction of cicatrices restraining the action of the jaws, etc.

A gangrenous affection of a similar character may commence in the fauces or pharynx, in some cases from diphtheria or scarlet fever, or from an intense tonsilitis. It may, however, occur independently of these, and from causes which produce the ordinary noma. In these cases the local and general symptoms are somewhat similar to those just mentioned ; but the situation of the lesion causes the pain, difficulty of swallowing, and distress to be greater, and the final result is the same.

These gangrenous conditions are often popularly attributed to the effects of mercury ; prosecutions for malpractice have been based upon such cases, and not unfrequently severe censures have been passed upon physicians and their reputations have been impaired. Great care in diagnosis should be exercised, as well as caution in the expression of opinions, lest injustice be done, not only to individuals but to the profession and medical science.

Treatment.—As these gangrenous affections are indicative of a low condition of the system, and are connected with an adynamic and debilitated state, it is of the first importance to maintain the strength of the patient. To this end the most nutritious and digestible articles of food must be regularly given, and tonic medicines administered. Quinine and chlorate of potash must be the main reliance ; but diffusible stimulants, the tinct. of bark, etc., and, in the more protracted cases, preparations of iron may be required. If the chlorate of potash irritates the stomach, it must be omitted or the quantity reduced ; but the quinine should be continued, though not in sedative doses. Opium may also be of great service, not merely to procure rest, but to aid in relieving the system from shock, and in checking the progress of the disease. The local treatment will consist in keeping the parts clean ; washing them frequently with antiseptic fluids, with solutions of chlorine, chlorate or permanganate of potash, salicylic or carbolic acid, etc.; and it is generally advised that the gangrenous tracts themselves should be freely treated with escharotics.

Those that have most authority in their favor are pure hydrochloric or nitric acid, carefully applied, or the actual cautery. Either chloride of zinc or bromine will act very efficiently as an escharotic, or the Vienna paste may be used.

Complications sometimes occur, such as pneumonia and diarrhœa; in most cases probably due to purulent, or rather septic infection. From this arises the greater necessity of destroying the slough with escharotics, and applying the antiseptic washes to destroy the decomposing matters and prevent their absorption. The complications must be treated according to their conditions.

Inflammation of the gums in dentition, though belonging to the special diseases of children, so often falls under the care of the general practitioner as to call for a passing notice. In ordinary cases the eruption of the teeth, especially in the first dentition, gives more or less uneasiness and irritation, if not absolute pain. Doubtless more ills are often attributed to teething than belong to it ; but previous to the complete eruption, and at the time, the gums concerned are sometimes decidedly inflamed and very painful, and even suppuration and ulceration may occur. The irritation of the gums may cause feverishness, restlessness, diarrhœa, especially in the summer months, and even convulsions. These symptoms may be mitigated by various items of treatment ; but in the large majority of cases, when the teeth are sufficiently advanced to be prominent and these symptoms occur, the most speedy and efficacious treatment is to freely lance the inflamed gums, cutting down entirely to the teeth ; especially if convulsions occur the gums must be effectually divided.

GLOSSITIS.

The tongue, in common with other internal portions of the mouth, is subject to superficial inflammations arising from physical or chemical injuries, from derangements of the stomach, etc. It is the seat of aphthæ, of thrush, and of diphtheritic and other specific inflammations. It is liable to be bitten in epilepsy and other convulsions, and to be irritated and ulcerated by the rough angles of imperfect teeth.

Occasionally a phlegmonous or deep-seated inflammation of this organ occurs, presenting very painful symptoms. It may be the result of mechanical injuries, of the application of caustic substances, of the sting of insects, or of the action of mercury. It may occur as a disease secondary to pyæmia, to typhus, and it is said, to rheumatism; it is often much swollen in small-pox, and sometimes in consequence of other diseases of the mouth and throat. It sometimes occurs independently of all such causes as an idiopathic affection.

Phlegmonous acute inflammation of the tongue may be preceded for a short time, like many other inflammations, by feverishness and a sense of chilliness, or the pain, swelling, etc., of the tongue may be among the first noticeable symptoms. A rise of temperature is, however, soon present. The whole tongue is usually involved, but the inflammation may be unilateral. Whether it be the primary seat of the disease, or secondary by extension from other parts, the usual phenomena of inflammation occur—hyperæmia, proliferation, exudations, corpuscular and fibrinous—causing the swelling. The surface is involved, the mucous membrane thickened, and on the dorsum particularly the epithelium accumulates, often mingled with bloody matters, giving the tongue a dark, and sometimes almost a black appearance.

This inflammation is painful, and sometimes so extensive as to cause the tongue to fill the mouth, to protrude between the teeth, and to extend back and interfere not only with deglutition, but with respiration also, and of course with speech.

It may terminate in resolution, in suppuration, or in more or less induration, and more rarely in gangrene. The course may be rapid or more slow; it sometimes becomes chronic after an acute attack, and sometimes is chronic from the beginning, with induration among the early conditions. Cases of chronic glossitis may be partial, produced by friction from sharp fragments of the teeth, or by tartar upon them, and the increase of connective tissue and solid exudations in a limited part will present the appearance of a tumor. It may even be mistaken for a cancer, and should be distinguished from it by carefully observing the history and appearance. It may also be confounded with syphilitic enlargement or gummata; in the latter case, however, there will be a history of syphilis, and a yielding to anti-syphilitic treatment.

Sometimes a peculiar chronic form of glossitis occurs, the tongue being enlarged, dry, fissured, and often very painful. This has been observed in syphilitic patients, and the question may then be presented, whether it is the effect of syphilis or of the mercury taken for its cure.

In nervous, hypochondriacal women, a papillary form of glossitis is sometimes observed. The papillæ on the back part of the tongue are prominent, red, hard, hot, painful, and produce great uneasiness and irritation.

Jaccoud has seen cases in men who were smokers, and he attributes it in these cases to that cause.

The sufferings of a patient from glossitis are usually out of proportion to his danger. The pain is often great, but the sense and fear of impending suffocation in severe cases may be very great and sufficient to prevent all rest and peace.

Treatment.—This is to be conducted on the same general principles as for other local inflammations. When the glossitis is superficial, the treatment will be the same as already described for stomatitis.

Deep-seated, acute cases require energetic measures. Soothing and cleansing washes should be used, leeches may be applied to the tongue itself, or to the swollen parts externally, followed by fomentations; or if the swelling be great, longitudinal incisions should be made in the tongue. Such incisions thoroughly made are generally very efficacious in reducing the swelling and procuring relief; and if an abscess forms it should at once be freely opened.

Internally a saline cathartic should early be given, and the bowels kept open; and febrifuge treatment as in other inflammations will be required. Febrifuge doses of quinine in severe cases should have a trial, and opiates, used however with caution when suffocation is threatened, may procure great relief. Steaming as for tonsilitis, early, and repeated from time to time, is also useful. Tracheotomy is the last resort in case suffocation is seriously threatened. In cases at all protracted, care must be taken respecting foods—liquid preparations must be given; and in case swallowing is impossible they may be introduced by the stomach-pump through the nose, or can be given by enema.

In chronic cases the cause must be observed and removed; sorbefacients, iodides, etc., should be used; and in some cases surgical interference may be demanded. To the fissured variety astringents and nitrate of silver locally are advised. The caustic is to be applied in the fissures and over the surface generally.

INFLAMMATION OF THE THROAT.—CYNANCHE.—ANGINA.

Inflammations of the throat are divided into catarrhal, superficial or erythematous, and deep-seated or phlegmonous. They are also divided according to the particular part of the throat which is specially the seat of the inflammation.

The general terms indicating inflammation of the throat as a whole are used, because the disease very seldom affects any one part without involving the rest. The parts are so intimately connected by proximity, by similarity of structure, and by nervous and vascular supply, that these inflammatory diseases may properly be considered together. When an inflammation commences at one point it generally extends to others, and the whole throat is often simultaneously attacked. The disease in each particular part has some peculiarities, but the chief distinction as to the parts involved is made between the superficial and deep-seated varieties. The specific character of the inflammation also influences its course and treatment, much more than the region in which it is situated.

An inflammation of the throat may be primary or idiopathic, or secondary and symptomatic of some other disease.

Thus, a sore throat may occur from extension of the disease from the mouth, tongue, nose, or larynx; and it may occur as a part or a complication of the exanthemata or other acute affections. It is almost constant in scarlatina and small-pox; very frequent, though not so severe, in measles; and not unfrequent in erysipelas, typhoid fever, pneumonia, rheumatism, and some of the cutaneous affections; and there are some chronic diseases, as syphilis, phthisis, stomach derangements, etc., that are accompanied with soreness of the throat.

The most common cause of all the acute or idiopathic sore throats is "catching cold." This may occur from exposure when overheated, from change of weather, or change of warm clothing to thinner garments, from wetting the feet, partial exposures, and other similar familiar causes. Using hot and cold ingesta at the same meal; irritating substances in the atmosphere; the use of certain medicinal or poisonous agents, as mercury, iodine, bromine, antimony, zinc, alcohol, belladonna, stramonium, tobacco, etc., may act as causes. Excessive use of the voice, or excessive indulgence in condiments and rich food; reflex influences from distant organs (as the heart, stomach and intestines, liver, genito-urinary organs, etc.) are also classed among the causes. The influence of these latter causes affects the mucous membrane much more than the deeper parts.

Acute catarrhal inflammation of the mucous membrane covering the fauces, tonsils, soft palate, uvula, pharynx, etc., is perhaps the most common form of sore throat. In ordinary mild cases it is but a slight affair, and often attracts but little attention. As the result of taking cold, the same conditions of hyperæmia, at first diminished and afterward increased secretions, occur. In short, the condition of irritation and mild inflammation affects the Schneiderian and laryngeal, as well as the faucal and pharyngeal membranes, and a catarrhal sore throat results. From its not unfrequent greater severity, or its longer continuance, it becomes a subject of care and treatment. It is generally accompanied with slight feverishness, and in the severer forms there may be rigors with decided feelings of indisposition, the temperature rising to 101° or 102°. In these cases the mucous membrane is intensely red, and more or less swollen, and there is œdema of the mucous and submucous tissue. When this extends to the glottis and larynx, hoarseness and dyspnœa are apt to result. There is a sense of accumulation within the throat, and a disposition to clear it by hawking or swallowing. The uvula is elongated, often to the extent of producing irritation and cough, by its falling upon the epiglottis or the roots of the tongue. This affection continues commonly for only a few days, and is without danger except in the very rare cases where there is œdema of the glottis.

Treatment.—The treatment, where treatment is called for, may be commenced with a Dover's powder or a dose of morphine, with free steaming of the throat, and this followed the next day by a saline cathartic. Should the stomach be loaded with a full meal, especially of food not the most digestible, a mild emetic might, with great advantage, precede all other measures. If the inflammation persists, a few free doses of quinine, or quinine and chlorate of potash, may be given, and this will very generally shorten materially the course of the disease. If much œdema occurs, scarification will be useful, and sometimes the œdematous and elongated uvula may be clipped off, thus relieving the irritation it causes. Astringents, as solutions of alum, borax, or tannin, are generally recommended, and in advanced stages may be useful; but in the earlier stages the inhalation of warm vapor, and fomentations externally, are more efficient in favoring resolution. Stimulating gargles are, as a rule, contra-indicated in the acute stages. Sipping mucilaginous liquids procures relief, and some advise taking into the throat and swallowing small pieces of ice. Astringents and ice on the one hand, and relaxants, steam, and warmth on the other, though opposite modes of treatment, may both be useful, abating the inflammation, but in different ways. The one by constringing the vessels and suppressing action, the other by promoting secretion and unloading the vessels and tissues, and soothing irritation. In some cases one may be the better plan, and in others the other; but, as a rule, I prefer the warmth and steaming; still, whichever plan is adopted, it should not be alternated with the other. The diet should consist of liquid foods, milk mingled with farinaceous substances in a fluid form, preparations of eggs, etc., while swallowing is painful.

The patient should be confined to his room at least, and often to his bed or lounge, and the extremities kept warm by suitable covering after more heat has for a time been applied to the feet. This is an important item of the best treatment.

A variety of faucal and pharyngeal inflammation is occasionally observed where a more or less abundant secretion of glutinous matter from the follicles gives rise to a white or ash-colored exudate upon the membrane.

This pultaceous deposit may be mistaken for the diphtheritic membrane. It differs from it in its composition and character, and particularly in the accompanying general affection. This exudate is transient, is easily wiped away except where it dips into the follicular depressions in the tonsils and cannot be readily reached. This variety of acute sore throat is as benign as the ordinary form, and requires only the same treatment. It is important to distinguish it from diphtheria, as otherwise statistics of therapeutical success in the latter disease become vitiated.

Another variety of superficial inflammatory sore throat is characterized by serous infiltration into the submucous tissue, and is known as *œdematous angina.* It is often developed suddenly, and produces more or less difficulty of swallowing and breathing. Should the œdema extend to the glottis, the dyspnœa might be severe and dangerous, requiring surgical interference, scarification of the glottis, or even laryngotomy. In all ordinary cases, however, no other treatment is required than that which is applicable to the other varieties.

CHRONIC INFLAMMATION OF THE MUCOUS MEMBRANE OF THE THROAT. —CHRONIC PHARYNGITIS.—CHRONIC FOLLICULAR PHARYNGITIS. —CHRONIC CATARRH OF THE THROAT.

This is a frequent, a troublesome, and an obstinate affection, more frequent in men than in women, and oftener found among professional and business men, and among students, than among the common laboring classes.

This inflammation may be idiopathic or traumatic, apparently primary, or secondary to other morbid conditions.

It may be an element of diphtheria following that disease, or of tuberculosis, or syphilis, or scrofula, or cancer, or of gout, rheumatism, or erysipelas, of albuminuria, of glandular swellings, of tumors or strictures of the part; it may follow the exanthematic fevers, it may be associated with diseases of the skin; not unfrequently with nervous affections, but more frequently than with any, or possibly with all the rest, it is associated with, and very often dependent upon, diseases of the digestive apparatus, particularly of the stomach.

The mucous membrane of the throat is particularly prone to chronic disease. It is exposed to many irritating impressions; it is liable to be affected by the extension of skin diseases; it is constantly in use, and is in close sympathy with the stomach.

In its treatment no continuous applications can be made, and the morbid condition often resists those that can be only temporarily applied.

The membrane, in these cases of chronic pharyngitis, is reddened, the surface, though sometimes smooth, is generally rough and irregular, presenting a granular or mammillated appearance. The secretion is affected; sometimes it is diminished, and the throat is dry and glossy; at other times it is increased, and of course is perverted, and is often tenacious and adherent. Normally the effusion moistening the surface of the membrane is serous, but under this inflammatory irritation the epithelial cells are rapidly but imperfectly produced, mingled sometimes with leucocytes, constituting mucus, with a variable quantity of serous and more solid material, producing a more or less tenacious coating of the surface, which excites frequent effort to clear it from the throat. Sometimes the secretion remains quite serous, and, when abundant, it collects in drops, looks like granulations, and may be mistaken for them. When the surface is abraded of its epithelium it presents the appearance of an ulcer.

The unevenness of the surface is in part from hypertrophy of the follicles, and in part from the rapid proliferation of the epithelial cells pushing up in points. Not only mucus, but pus may be produced without the occurrence of the ulcerative process, or the full destruction of the epithelial covering—a secretion taking place from the follicles.

Sometimes the exudate is fibrinous, and the water evaporating from the albuminoid matter, a pellicle is formed of considerable thickness and firmness, which is with difficulty removed.

Chronic inflammation of the throat may commence in the mouth, nasal passages, or the larynx, but more frequently its original seat is in the pharynx, and it may be confined chiefly to that part. It not unfrequently extends to the air-passages, though seldom to the œsophagus, and laryngitis often follows pharyngitis. Contiguous sympathy, and the more remote sympathy with the stomach operate both ways. The irritation of the pharynx often involves the larynx, and that of the larynx the pharynx. So an irritation of the throat affects the stomach, and that of the stomach the throat.

The *causes* of the chronic sore throat—besides the inflammation or the diseases with which it is associated and of which it forms an element—are, exposure to cold and dampness, the inhalation of dust, the breathing of the atmosphère in workshops, mills, laboratories, etc., the inhalation of tobacco smoke, the alternate use of hot and cold drinks, ice-cream followed by hot coffee, and the free use of ice-water with a hot dinner. Though occurring in others, it is frequent in those who use alcohol, and in many cases is clearly traceable to alcoholism. Its connection with, and dependence upon, other morbid conditions must not be overlooked.

Diagnosis.—The diagnosis is to be made by the symptoms of uncomfortable sensations in the part, by the disposition to be frequently clearing the throat, etc., but more particularly by a careful inspection of the part. For this purpose an angular tongue depressor is convenient, and in some cases sufficient; but to determine the extent of the disease, and especially the condition of the glottis and deeper parts, the laryngoscope is important. This consists essentially of a mirror which throws a strong and concentrated light into the throat, with another small mirror placed at an angle of about 120 degrees, with a long handle, and which is held in the throat in such positions as to reflect images of the parts out of the direct line of vision. After some practice in the manipulation, all the parts, even to the interior of the larynx, can be made open to accurate observation.

This chronic follicular pharyngitis is particularly frequent in our American towns, and from its obstinacy it often comes under the notice of physicians. Its particular history in each case requires to be understood. The manner of attack varies. It is sometimes the result of more acute inflammations, but it oftener comes on gradually. When so, there is noticed first uneasiness and a sense of dryness, or a secretion of tenacious muco-plastic matter which produces irritation, sometimes a cough, especially in the morning, and nearly always a disposition to clear the throat. The voice is apt to be husky, and not to be fully depended upon, and there is often a perceptible degree of hoarseness. As the Eustachian tubes are apt to be involved, there is sometimes impairment of hearing.

Prognosis.—The *prognosis* is favorable as to immediate danger, but not as to speedy cure. Left to itself, with the continuance of the causes which have contributed to produce it, it usually continues on indefinitely. It is often exceedingly obstinate under the best management, and generally requires a protracted course of treatment for its removal.

Treatment.—The *treatment* is both general and local. In the general treatment reference must be had to the causes which produce it. The indigestion, the constipation, the sedentary life, the neglect of the skin, the exposures, the improper ingesta, the public speaking, and the emotional excitements which are among the more frequent causes, must all, as far as possible, be removed. Still the part cannot be entirely at rest; more or less exposure will occur, and the treatment is not as successful as could be desired. As it must usually be protracted the patient should generally, in the beginning, be so informed.

The improvement of the general health should be a principal object. The strictest attention should be given to avoiding the causes, and to complying with all hygienic conditions. Particularly should attention be given to correcting the state of the stomach and bowels, so often at fault in these cases.

The urine should be examined, and it will sometimes be found that the lithates abound, or that the peculiar perversion of digestion and assimilation which results in the production of oxalate of lime in the blood and tissues, with its appearance in the urine, is present.

These various conditions and their particular treatment need not here be detailed; they will be described in other connections. What is called an alterative and a laxative course will often be required. Small doses of mercury, as the $\frac{1}{40}$ to the $\frac{1}{20}$ of a grain of the bichloride, once or twice a day for some days, or for two weeks, or possibly more, with mild doses of some saline laxative occasionally, will often be found very useful. This should often be followed by an alterative course of iodide of potassium, or the iodide might be given without the preceding mercurial. Fowler's solution, in ordinary doses, is another article which is sometimes thought to be useful. In some cases tonics are required, but more frequently alteratives and eliminatives are needed. If oxaluria be found to exist, the nitro-hydrochloric acid will be found useful; and, in short, the general treatment must be governed by the general condition of the system and the particular symptoms observed. The internal use of the fluid extract of hamamelis, or witch-hazel, sometimes appears to produce a decided and somewhat specific action upon this condition of the throat. I have given it in connection with iodide of potassium, and also alone, with apparent decided effects. It is held in very high esteem in this and other affections by some whose opinions, based upon experience, are entitled to respect. It is worthy of more extensive trial in chronic pharyngeal inflammations.

The local application most frequently used, and which is often very useful, is the nitrate of silver. After clearing away the mucus by syringing or mopping out the throat, a solution of the pure nitrate, of the strength of from forty to sixty grains to the ounce of distilled water, or even up to a saturated solution, may be applied with a small, soft sponge, or a camel's-hair brush, and repeated once in two, three, or four days, according to the effect. Although this is sometimes useful, there are times when it is of no benefit, and it may increase the irritation. It will sometimes relieve the symptoms for a time, and then cease to have any beneficial effect. In other cases it may for a time aggravate the symptoms, but by perseverance in its use good effects will at length be realized. In obstinate cases the follicles may be split, and a stick of the caustic applied to the incision. If the silver fails after a fair trial, the chloride of zinc, or the iodide of zinc, or iodine, in different preparations and of different strengths, may be applied. Atomized fluids, alterative and astringent, weaker or stronger, and more or less frequently, may be used. Whatever the application, the mucus, sometimes thick and adherent, which so often covers the surface, must be removed before the application will produce its full effect. Sometimes an application of glycerine and tannin, made with a brush—from half a drachm to two drachms of tannin to an ounce of glycerine—will do excellent service. The chlorate of potash, locally applied in strong solution, or in the form of lozenges, and the chlorate taken internally will often procure relief. A little glycerine taken frequently upon the tongue will not only relieve the sense of dryness and irritation, but may modify more permanently the inflamed surface.

The nasal douche, with warm water holding in solution a little salt, will clear away any obstruction in the posterior nares; but free cold injections into the throat sometimes induce inflammations of the internal ear, and should be avoided.

The local treatment should be conducted on the same principles as in a case of chronic conjunctivitis, and no positive course can be laid down beforehand and rigidly adhered to. The practitioner must be governed by the effects produced and by his experienced judgment.

Lately it has been recommended that the actual cautery, by means of the galvano-cautery, be applied in obstinate cases that resist other measures; but it has not as yet been sufficiently used to test its comparative efficacy or its applicability.

The bromide of potassium and bromide of sodium are supposed to operate somewhat particularly upon the throat, diminishing its sensibility and allaying irritation. Various anodynes, such as conium maculatum, hyoscyamus, lactucarium, and preparations of opium, procure relief to the symptoms; but care must be taken, in chronic cases of this kind, that habits of narcotism be not established. Various lozenges containing cubebs, with conium, and small doses of ipecac. made up with extract of liquorice, often produce a soothing effect, at least temporarily, and may aid in the cure. Time, patience, and perseverance, with the strictest observance of hygienic rules, the avoidance of alcohol, tobacco, and all other injurious influences, will be necessary to the best success. As a last resort, a change of climate may be tried.

CHEESY DEPOSITS IN THE FOLLICLES OF THE TONSILS.

Another variety of chronic inflammation of the throat, or a complicating symptom of this disease, requires to be noticed. The follicles of the tonsils have formed within them little masses of an unctuous, light-colored, cheesy-looking substance, which project from the surface, are easily removed by a spatula or a probe, and, when pressed upon, are readily crushed, emitting a fetid odor. This form of the affection may occur in men or women, and has been seen at different ages, but more frequently, in my experience, in young adults. As these little concretions are not unfrequently thrown out by coughing, they are sometimes mistaken for tuberculous matter, and may excite much alarm.

They are not of serious import, and these cases require treatment similar to those where this condition does not exist. The application of a strong solution of nitrate of silver to the tonsils will generally check the production of this cheesy matter.

These simpler diseases of the throat should be carefully distinguished from syphilitic affections of these parts. There is far less tendency to ulceration in those which have been described than in the syphilitic, and the further characteristics of the latter are redness more in patches, the color more livid, but with whitish patches from thickening of the epithelium ; and the principal lesion is seated upon the soft palate.

Extending and eroding ulcers of this part cause suspicions of syphilis ; and other lesions of a specific character, together with the history of the case, will make the diagnosis clear.

The inflammation in chronic pharyngitis may extend to the larynx, though it is not likely to do so ; but when this is the case, special restrictions as to the use of the voice are necessary. A sore throat may occur in consumptive persons, and the larynx in them is frequently affected by tuberculous deposits and ulcerative processes, but ordinary pharyngitis is not indicative of a consumptive tendency. The prognosis, therefore, though not favorable as to a speedy cure, is not unfavorable as to the life of the patient.

Sometimes, but very rarely, a slow ulcerative process occurs in the throat, independent of any syphilitic influence. It is recognized by excluding the history and all other evidence of the syphilitic taint. It occurs in debilitated conditions of the system, and requires to be treated as other similar ulcerations, by tonics, alterative applications, etc.

ACUTE PHLEGMONOUS INFLAMMATIONS OF THE THROAT.

These are inflammations of a parenchymatous character, having their chief seat in the tissues deeper than the mucous membrane. They are not unfrequent. There are varieties as to the character and particular seat of the inflammation; but they are all marked by pain, more or less difficulty of swallowing, perceptible swelling, and febrile movement. There is change of voice, often cough, and more or less deafness, and sometimes dyspnœa; and a proper examination will show not only the general character, but the particular location of the disease.

RETRO-PHARYNGEAL ABSCESS.—POST-PHARYNGEAL PHLEGMON.

This is a phlegmonous inflammation resulting in suppuration, having its seat beneath the mucous membrane covering the wall of the pharynx, in front of the cervical vertebræ. It may occur as a primary inflammation in the loose connective tissue beneath the membrane, especially in children; or from extension of inflammation from the tonsils, or from the deep cervical or the bronchial lymphatic glands; or it may be the result of primary disease in the bodies of the cervical vertebræ.

The acute primary cases are marked by pain, tumefaction, and febrile movement, and the attack may be abrupt, and the progress to suppuration rapid. In the secondary cases the progress will be slower, but varied in this respect by the character of the primary disease. There will be difficulty of swallowing, and often of breathing, and thickness of the voice; and particularly when from caries of the vertebræ there will be pain on moving the head, which becomes more or less fixed in its position, the neck often much swollen externally; and in all the cases, on examination with the finger, carried gently over the base of the tongue, a hard, brawny tumor will be felt in the early stage, but a soft, fluctuating one as free suppuration occurs.

The usual changes in the character of the symptoms take place as suppuration is established; and, left to itself, the abscess may be discharged into the lower pharynx, or the pus may extend downward into the posterior mediastinum and may be discharged into the pleural

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the trachea, or even the carotid

may be excited by cold and the
of the throat; and in this form
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causes, however, are syphilis and
or suppuration of the glands.
and suppuration of the tonsils,
affection are operative in this.
anger of these abscesses will depend
conditions. They will be more
syphilitic cases, and any form may

to themselves the prognosis is gen-
occur from the matters traveling and
producing suffocation by pressing upon
œdema of the glottis; or upon the
the matters filling up the air-passages.
associated with caries of the vertebræ, or with
the patient may be worn out by these
processes after the abscess is discharged.
inability to swallow may be absolute, con-

disease is to be distinguished by the symptoms
and particularly by the ocular and digital
in swallowing, the difficulty of breathing, the
history of the case will aid in the diagnosis.
should be distinguished from that of croup. It
disease often from œdema of the glottis, and in
mechanical reasons, the inspiration is more
expiration, while in croup inspiration and expira-
ally affected.

—In acute and primary cases the general treatment
that of tonsilitis, and should be pursued with at
as, unchecked, the results are so much more grave.
occurs, which is to be ascertained by careful
the abscess should be freely opened, and as low
possible, to evacuate all the matter.
should be made in the mesial line, in order to avoid
considerable size; and when the collection of matter is behind
the greatest care is necessary not to wound the vessels of
and in these cases the trochar or aspirator will be safer.
of the glottis threatening suffocation, incisions into the

œdematous part and letting out the serum will be important. An angular bistoury, guided by the finger, may suffice, but the laryngoscope will aid in this somewhat difficult operation.

Laryngotomy, or tracheotomy, as in other obstructions to respiration in the throat, must be held in reserve as a last resort. In glandular and carious complications, or where an ulcerative process follows, treatment adapted to these conditions will be required.

TONSILITIS.—AMYGDALITIS.—QUINSY.

This is a phlegmonous or parenchymatous inflammation of the tonsils, extending more or less to the neighboring parts, and sometimes involving the salivary glands. There is a strong tendency in this inflammation to suppuration, but it may spontaneously terminate in resolution, and resolution may very often be induced by treatment. The inflammation may extend to the glottis, pharynx, and larynx, inducing œdema of the glottis and seriously obstructing respiration. This, however, is not frequent; and the only difficulty of breathing is usually from the great swelling of the tonsils which sometimes occurs.

The symptoms of tonsilitis are usually marked, and the course of the disease rapid.

The access is generally abrupt. There is a chill and active fever; the pulse is bounding, and the temperature goes up to 103°, 104°, or even 105°. There is pain, marked difficulty of swallowing, and a thick voice. A proper external examination will detect tumefactions deep behind the angles of the jaw, and by looking into the throat the whole fauces and pharynx will be found hyperæmic, the uvula will be swollen and resting often upon a tonsil, and the tonsils themselves will often appear like two balls of flesh, approaching and sometimes meeting each other, and filling up the throat.

The disease is sometimes more gradual in its access, and the swelling may not be as great.

Prognosis.—The prognosis is very favorable, unless there is serious interference with respiration by the extreme swelling, or by the inflammation extending to the air-passages.

It may terminate in resolution, suppuration, or possibly gangrene.

When in resolution, the termination may be in a very few days; but when suppuration takes place, the case is more protracted. A gangrenous termination is very rare, and its course uncertain. The disease may linger and become subacute; and where repeated attacks occur, as is not unfrequently the case, the tonsils may become hypertrophied, producing the usual result of such enlargements.

Diagnosis.—It is to be distinguished from post-pharyngeal abscess, from diphtheria, from scarlatina anginosa, from erysipelas of the throat, from acute catarrhal inflammation or pharyngitis, from parotitis, and laryngitis. A comparison with diphtheria has been made (see page 316). The difference between this and the other affections named will be sufficiently obvious without being particularly pointed out.

Treatment.—The treatment of tonsilitis is important, as, when early undertaken, the disease is much under the control of remedies. Without giving an account of the numerous methods which have been recommended, I will do little more than describe a course of treatment the main features of which were long ago received from Prof. J. Delamater, and the efficacy of which has been proven by all my subsequent experience.

On seeing a patient, especially early in the attack, an opiate, as a free dose of Dover's powder, should at once be given. A decoction of hops is to be made, and after the strength has been largely extracted by the hot water, vinegar is to be added in an amount approaching that of the hop decoction, and the whole heated together. While this preparation is going on, a *brick* may be broken into fragments about the size of a hen's egg, and put into the fire. The hops, vinegar, and water should then be put all together into a pan, taken into the lap, and the head and pan covered with a blanket. Pieces of the hot brick, from time to time, should be dropped into the pan, and the volume of steam produced should be allowed to envelop the throat and face, and should be inhaled as warm and as freely as can be borne, air being admitted more freely, from time to time, as may be necessary. This steaming process may be kept up for from twenty to forty minutes. The hops, with perhaps an addition of some meal to make a more consistent poultice, and a little mustard, to produce a moderate amount of counter-irritation, are to be applied in a muslin bag to the throat, and the patient allowed to rest quietly in bed, well covered. The Dover's powder, the steaming, and the poultice, may be repeated in a few hours, as may be deemed necessary. According to the testimony of Prof. Delamater, fully confirmed by my own experience, this treatment, when applied early, will check the inflammation very markedly, and almost invariably prevent suppuration. The next day, or a little later, a saline cathartic should be given, and if the treatment is commenced early, a cure will very soon be effected. If the inflammation has gone so far that suppuration cannot be prevented, the symptoms will still be greatly relieved, and the spread and extent of the inflammation diminished.

In advanced or more severe and obstinate cases, scarification of the tonsils—quite decided incisions into them—will generally procure marked additional relief. When suppuration occurs, which may usually be distinguished by the softened feel of the tumor, the abscess should be opened; and in all uses of a cutting instrument about the parts, the blade should be guarded by being wound to within half an inch or so of the point, and the back of the knife should be kept toward the vessels, and the cutting toward the mesial line of the body. Besides, the head and hands, especially of a child, should be firmly held, to prevent accidents from struggling. Later, astringent gargles may be used; but earlier, the steaming process is much more efficient. Other particular processes of steaming may answer the indication, but I have found none quite as efficient as the one described.

If, instead of the simple Dover's powder or other form of opiate, five or six grains of quinine for an adult be added, and repeated a few times, the resolution will be still more certainly effected. The opiate, with the steaming, etc., is so generally successful that the addition of the quinine is not often required. Where, however, the steaming cannot be properly carried out, the quinine, in the doses indicated, often combined with chlorate of potash and carried to the extent of from a scruple to twenty-five or thirty grains, will very seldom fail to produce resolution.

It may be well simply to add that gum guaiacum in doses of from ten to twenty grains, or from half a drachm to a drachm of the tincture, given once in from two to four hours, is said to be very efficient in producing resolution. Some persons are particularly liable to the recurrence of tonsilitis with rapid suppuration; but even in these cases, where the treatment recommended is promptly applied, suppuration may generally be prevented.

A form of sore throat has been described, of which I have seen not a few instances, under the name of *Spreading Quinsy* or *Epidemic Quinsy*.

It is marked by lassitude, pain in the limbs and back, slight chills, disordered stomach, decided fever (temperature from 101° to 104°), pricking sensations in the throat, hawking, etc. The tonsils are enlarged and inflamed, the redness extending over the pharynx, fauces, and uvula. Yellowish opaque spots are sometimes seen in large patches after the disease has continued some little time, but they are easily detached.

There is tenderness under the jaw, and pain in swallowing, and the salivary glands are generally somewhat swollen. The tonsils are not as much enlarged as in ordinary quinsy, and not as much inclined to suppuration.

The general symptoms are quite severe; there is more depression than in common quinsy, sometimes delirium in the evening; the urine is febrile but not albuminous; there is much weakness during the fever, and it often continues afterward; and when the disease is left to its course the active symptoms last about a week.

It is a *Filth Disease,* and is apt to occur on exposure to sewer gas or other decomposing substances. It has often been observed in workers in the dissecting-room when material is not well preserved. On one occasion under my observation a family of several persons, otherwise well cared for, were all taken ill a day or two after the cleaning out of a common privy which was situated in an out-building, but under a continuous roof with the dwelling. During the cleaning a terrible stench pervaded the whole house for several hours. The disease in all these cases was characteristically such as described.

Treatment.—The best treatment consists in the administration of a cathartic, followed by a diaphoretic, but particularly by quinine in doses sufficient to produce its antidotal and antipyretic effects. Five or six grains should be given at a dose, and repeated several times at intervals of a few hours, in combination with ten or twelve grains of chlorate of potash; and when there is much pain and restlessness, an occasional anodyne should be added; and the steaming process for soothing the local affection should be used. Recovery takes place in a much shorter time when these means are promptly resorted to.

Chronic Enlargement of the tonsils, as removal is often required, is generally considered surgical, and need not here be described. In the earlier stages of these enlargements, iodine in the form of tincture locally applied, and some preparation of it taken internally, will sometimes cause absorption and prevent the necessity of a resort to extirpation.

An acute disease formerly described as *Malignant Sore Throat,* or as *Phagedenic* or *Ulcerated Sore Throat,* in many of the cases perhaps identical with diphtheria, though in others apparently different from it, has been recognized. It resembles the sore throat of scarlatina, is a low typhoid form of disease, and is probably connected with a blood poison. Its course has varied, and it has not been well defined. There is, however, a depressing influence and a gangrenous tendency.

Treatment.—The *treatment* should consist in giving a good diet—beef-tea, preparations of eggs and milk—and in the administration of quinine and chlorate of potash, tincture of iron, stimulants, etc. Steaming and antiseptic gargles, as in diphtheria, will also be applicable. Salicylic acid with carb. of ammonia and soda may be tried internally.

DISEASES OF THE ŒSOPHAGUS.

There are several morbid conditions of the œsophagus met with occasionally, some of which, requiring manipulations, are generally treated of in works of surgery, and more properly belong to them. Some, however, occur in connection with medical cases, and require a brief notice here.

ŒSOPHAGITIS.

Inflammation of the œsophagus is comparatively rare, and when existing is sometimes unrecognized. It may be either primary, or secondary to some other affection. When primary, it is usually due to some obvious external cause, such as the swallowing of irritating materials, caustics, too hot or too cold substances, angular bodies, etc. The secondary variety may result from the extension of inflammation from the parts above; or it may be an element or expression of an infectious disease, as small-pox, scarlatina, typhoid or typhus fever, and pyæmia.

A primary inflammation in this part does not differ materially from the same kind of inflammation in other mucous surfaces. If it continues long, hyperplasia of the submucous tissue and contraction of the tube is likely to occur; and if limited to the cardiac portion this stenosis may cause dilatation above. Suppuration may take place in the tissue, and abscesses form, or ulcerations may result, especially from the action of caustics or the mechanical irritation of foreign bodies.

Tartarized antimony may cause a pustular or pseudo-membranous form of inflammation, occupying the lower part of the tube; or caustics may destroy tissue which will result in rupture if sufficiently deep, or in stricture from the contracting cicatrix.

When there is extension of the bucco-pharyngeal inflammation, it partakes of the character of that from which it originates, and may be erythematous, aphthous, or parasitic. An inflammation may appear here toward the end of grave diseases, such as typhoid fever, pyæmia, cholera, cancer, tuberculosis, and suppuration of the urinary organs and the joints. In these cases the inflammation is of a catarrhal or diphtheritic character; though when consequent to small-pox, it is distinctly pustular, but coincident with the formation of false membrane.

Any of the forms of inflammation may be unrecognized during their continuance—the catarrhal, because the symptoms are not pronounced; those from the extension of the disease from above, because the symptoms may be attributed to the original affection; and those occurring in connection with the grave diseases, because the dysphagia, which is the chief symptom of all lesions of the œsophagus, may be attributed to the prostration produced by the primary disease.

But in inflammation of the œsophagus, when not obscured by other conditions, there is pain in the course of the tube, about the fork of the sternum, between the shoulders, or in the superior part of the epigastrium. This pain is not usually continuous, but is most during the act of deglutition and for some time afterward. The bolus may be prevented from passing down by spasmodic contraction of the tube, and may return by regurgitation, or, more rarely, by an act of vomiting. When thus rejected it is usually covered with mucus, which may be tinted with blood. When the bloody character of the regurgitated or vomited matter is constant, it indicates ulceration, and in the membranous variety fragments of false membrane may be discovered.

Pressure deep down in the cervical region may detect tenderness there, and serous infiltration outside of the œsophagus, in this region, may possibly press upon the trachea and cause difficulty of breathing.

As in other inflammations fever will be present.

The introduction of a sound will give pain, but will show absence of organic constriction, and on its withdrawal, covered with mucus, deglutition for the time will be improved. These symptoms and signs, when observed, will lead to a diagnosis.

Treatment.—The treatment must be conducted on general principles. When stomatitis or pharyngitis is also present, the treatment applicable to those conditions will suffice for this.

In severe cases accompanied with much febrile reaction leeching and cupping are advised. Ice may be held in the mouth, and small quantities of ice-water frequently swallowed, or iced slippery-elm water, or other mucilaginous drinks. Revulsives, sinapisms, blisters, or pustulations externally over the inflamed part, may be applied; laxatives should be given, and local sedatives and anodynes will give relief. Should much hemorrhage occur, ice must be insisted upon, and astringents may be required; but a moderate bleeding from the part need not be interfered with, as it would be likely to be followed by relief. When the acute stage is past, Jaccoud recommends large doses of iodide of potassium to promote absorption and prevent constriction.

STRICTURE OF THE ŒSOPHAGUS.—STENOSIS OF THE ŒSOPHAGUS.

Constriction of the œsophagus, so as to interfere with the passage of food into the stomach, may be either organic, from structural change, or functional, from spasmodic contraction. In addition to these conditions the passage may be obstructed by foreign substances within it, or by pressure upon it from without by tumors or by other means.

Structural alterations in the walls of the œsophagus, constituting organic strictures, may include hypertrophy and a limited induration, thickening and contraction of cicatricial tissue from previous loss of the normal structure by ulceration or the action of caustics, and tumors or neoplastic growths in the walls of the canal.

A limited hypertrophy and induration may be caused by inflammations, such as have been described; and these inflammations by the causes then mentioned. Syphilitic deposits and changes may be a cause of such stricture.

Constriction from neoplasms, in the majority of cases, is from cancerous growths; and these may be scirrhous, encephaloid, or epithelial. Cancer here is very generally primary, and is situated near one or the other extremity of the tube, seldom in the middle. Other tumors, such as tuberculous productions or fibroid growths, ordinarily pediculated, may occur, but they are rare.

External pressure upon the tube may be from cancer in the mediastinum, morbid growths in the bronchial glands, aneurisms of the aorta, subclavian, or carotid arteries, or anomalous positions of the subclavian artery. Constrictions are most likely to occur in those parts of the tube which are normally narrowest, viz., either in the cardiac region or at the junction of the cervical and dorsal vertebræ. There is usually a single stricture, but there may be more; and the degree varies from slight diminution of the calibre to complete obliteration of the passage. When the stenosis is so great as to materially obstruct the passage of the ingesta and cause their accumulation, dilatation (sometimes to a great extent) is likely to occur in the part above. This may be general and symmetrical, or unilateral, or irregular, according to the condition of the tube; and the part below the stricture may become atrophied or otherwise changed.

Symptoms.—The symptoms do not always correspond in severity with the gravity of the case. Dysphagia is of course the chief symptom. At first it may be manifested only at the commencement or close of a meal, and the patient has to use fluids in order to swallow with more ease.

The dysphagia gradually increases; only fluid or semi-fluid articles can be swallowed, and at length the food is regurgitated. Generally there is little or no pain until the food reaches the obstacle; then there is pain along the side and back, and behind the sternum—the pain not being always felt at the seat of the stricture.

A peculiar sound is sometimes heard by auscultation as the fluid passes through the narrow opening, and the precise location of the stricture can thus be ascertained. When the obstruction is high up, regurgitation will occur almost immediately after the food is taken. If low down, and especially after there is time for dilatation of the œsophagus above the stricture, food in considerable quantities may remain for a much longer time; but, while remaining, a painful sense of constriction will be felt in the chest. In cancerous constriction mucus and other secretions are apt to accumulate, and be rejected only by great effort; and the cancerous cachexia is developed. The stricture in these cases, though there is danger in the manipulation, may sometimes be temporarily diminished by the introduction of dilating instruments; but the disease is progressive, and the patient dies from the combined effect of the cancerous dyscrasia and inanition.

Strictures from inflammation or cicatricial contractions may often be cured.

Diagnosis.—The diagnosis of an organic obstruction is made by the dysphagia slowly coming on and persisting; and percussion and auscultation of the chest may reveal an obstacle, such as a tumor, outside of the œsophagus; but the introduction of an exploring instrument will give more precise knowledge of the existence, location, and extent of the stricture. The tube of the stomach-pump, or in case of extreme contraction, an elastic catheter will serve the purpose: but for the object merely of exploration, smooth round balls, securely attached to smooth, slender, and elastic pieces of whalebone of the proper length serve the purpose best. Ivory balls constructed for the purpose, or common "marbles" prepared by drilling holes through the centre and securely fastening the whalebone through them, will answer the purpose perfectly. When balls of different sizes are introduced, they show not only the position and calibre of the stricture, but its longitudinal extent. After passing a stricture they are free to pass on, as the small size of the whalebone will prevent its being grasped so as to obstruct the motion of the exploring instrument.

The withdrawal, as well as the introduction of the instrument, affords evidence of the extent of the stricture.

The history and appearance will afford indications of the nature of the obstructing cause.

Treatment.—The *treatment* of stricture from cancer can only be palliative, and the introduction of exploring or dilating instruments is not without danger.

When cancerous softening and ulceration are present, a false passage is liable to be made and followed more speedily by a fatal result.

Still, relief is often obtained by the occasional careful introduction of the tube of the stomach-pump, or some other suitable dilating probang. In one case in my own experience life was prolonged for many weeks, even in an ulcerated cancerous tumor, high up in the œsophagus, by the occasional introduction of a good-sized probang, the use of which was alone able to preserve the power of swallowing. The danger was appreciated, but the power of swallowing was lost, and there were no other means for its restoration and for keeping the passage open: therefore the necessity of the case and the wishes of the patient justified the procedure.

Obstructions produced by pressure from without the œsophagus may often be relieved by similar means. Cases, however, have occurred where an aneurism has been penetrated and a fatal hemorrhage has immediately followed. Where an aneurism is the cause of the obstruction, the probang is particularly dangerous.

In cases of stricture from inflammatory thickening, or the contraction of cicatricial texture, mercury and iodide of potassium may have an influence in causing absorption of exudates, and possibly in softening recent cicatrices; but the chief reliance is upon dilating probangs, repeatedly and perseveringly used. In introducing an instrument, unless it be particularly flexible, into the œsophagus, the head must be thrown backward so as to make the passage from the mouth to the stomach as straight a line as possible; and in case the stricture is narrow, a cone-shaped probang—perhaps at first an elastic male urethral bougie, and later larger instruments—the tube of the stomach-pump, or double conical or spindle-shaped solid probangs attached to whalebone handles, should be carried through the stricture. This operation should be repeated from time to time, larger instruments being used each time as may be required, thus producing mechanical dilatation of the stricture, and often restoring the function of the œsophagus. Very satisfactory results not unfrequently follow.

A long course of manipulations is sometimes necessary; and after apparently complete dilatation, the stricture may return, requiring a repetition of the operations. As in cases of stricture of the urethra, an occasional introduction of an instrument may be required to keep the passage free. In cases where little or no food has been received into the stomach for some time, and where swallowing, notwithstanding the introduction of an instrument, is still difficult, an elastic catheter or the tube of the stomach-pump must be used, and milk, broths, or other liquid food injected. This mode of feeding may be repeated until deglutition is established. In one case of this kind, which occurred in my experience, the patient arrived from a distance at the very point of starvation from a cicatricial stricture involving the very lowest part of the œsophagus and the cardiac orifice of the stomach ; and milk was injected through the open extremity of a rectal tube pressed down upon the stricture and the fluid forced into the stomach, even before a catheter could be passed through the minute opening. At the next attempt a small catheter was passed through the stricture, and liquid was injected through it. The patient, a lady, was fed in this way for days, until spindle-shaped probangs, at first of very small size, but gradually larger, attached to whalebone handles, accomplished the dilatation so that she at length was able to swallow ordinary food. She was sent home supplied with dilating instruments, which her physician occasionally introduced for some months afterward.

SPASMODIC STRICTURES OF THE ŒSOPHAGUS.—FUNCTIONAL STENOSIS OF THE ŒSOPHAGUS.

Etiology.—This may be produced by a variety of causes, and is a symptom of several morbid conditions. It may be excited by an inflammation of the œsophagus itself, or of the larynx or epiglottis.

It is often a symptom of hysteria, sometimes of epilepsy, and is an almost constant attendant upon hydrophobia and tetanus. It may depend upon diseases of the spinal cord or the cervical vertebræ ; but perhaps the most frequent cause is lesion of the brain. In hysteria and other conditions, it is often a reflex morbid action, following some obscure law of sympathy. It is more frequent in women than in men, and I have observed it about equally in young women and in those of middle and somewhat advanced life. The predisposing conditions are the nervous or hysterical temperament, pregnancy, the menopause, and some general diseases.

The imagination, fear, anger, and other disturbing mental influences, exert a large control over this symptom.

Cases are related where the fear of hydrophobia produced spasms of the pharynx and œsophagus resembling the symptoms of that disease.

Various irritating substances swallowed may excite it, and the apprehension of those who have suffered from it may cause its return.

Symptoms.—The onset of spasmodic stricture of the œsophagus usually is sudden. There may be a severe, constricting, distressing pain with the difficulty or impossibility of swallowing.

Some may be able to swallow warm drinks, but reject cold; while with others the reverse will be the case.

The spasm may be in the upper or lower part of the œsophagus, or in both—modifying by its locality the particular symptoms. There are other coincident symptoms besides the mere difficulty of swallowing, some of which continue during the interval of attempts to swallow, but are aggravated by such attempts. They are contractions of the cervical muscles, painful respiration, the ejection of free quantities of saliva and mucus, and sometimes fainting or great depression.

The face often expresses extreme distress, the veins of the neck are turgescent, the pulse may be small and frequent, and even general convulsive movements may take place, and for the time deglutition is impossible.

These severer paroxysms have been termed "Epileptiform Neuralgia of the Vagus." Oftener, however, the contractions are less paroxysmal and violent, but more mild and continuous, with irregular remissions and exacerbations.

Diagnosis.—There is usually not much difficulty in the *diagnosis* of these cases.

The suddenness of the onset, the causes that may be traced, the intermittence of the symptoms, and the presence of other nervous disorders generally render them distinguishable.

Still, these exacerbations and remissions may be united with an incipient organic change, so that a positive assertion of a simple spasmodic affection would not in all cases be justifiable. In doubtful cases the use of a large sound must determine as to the presence of an organic change. If a good-sized instrument can be passed with readiness, or with even some moderate force—and especially if in succeeding attempts no difficulty is experienced, or the obstruction felt is not always at the same point—the diagnosis will be sufficiently clear.

Sometimes a *paralysis* of the œsophagus exists which interferes with deglutition. Then the sound is more easily introduced even than in the natural state, and the food is not regurgitated. Besides, paralysis is permanent, while spasm is intermittent or remittent.

Auscultation of the œsophagus—listening with the stethoscope along its course behind the trachea, and on the left side of the spine below—may aid in diagnosis. Here, as elsewhere in auscultation, becoming familiar with the sounds produced in the part in the normal state is essential to the proper recognition of the deviations which occur in disease. Both the normal and morbid sounds are produced at the moment of deglutition, when they should be carefully observed.

Prognosis.—The *prognosis* in simple spasmodic stricture of the œsophagus is favorable as to immediate fatal results. Death occurs in hydrophobia, but from the general effect of the venom rather than from closure of this organ; and in some cases of hydrophobia there has been found not only coärctation, but also change of tissue in the walls of the tube.

Though spasm of the œsophagus is usually a more or less acute affection, it may become chronic, and the prognosis as to speedy cure may be doubtful. Cases lasting many years are reported; and I have seen one case, at least, that had passed through the hands of several physicians, and had lasted with pretty constant symptoms for a long period.

Treatment.—In case of complete stricture, the first and most pressing indication is to feed the patient. For accomplishing this purpose the introduction of a probang will generally be called for, thus overcoming the spasm, and convincing the patient that there is not a complete and impenetrable closure (which is often feared), and thus giving confidence and greater success in efforts at swallowing. This will generally not only enable the patient to swallow for the time being, but will often produce much more permanent results. Should the power of deglutition fail to be speedily restored, food should be injected into the stomach through the tube of a stomach-pump, while other means are being used for overcoming the morbid state. A large instrument in all these cases is better than a small one, and far less likely to do harm. A steady pressure for some little time may be required to tire out the contracting muscle, and, after the stricture is passed, the instrument should be allowed to remain for some little time, care being taken by proper position of the head, and other means, to prevent pressure upon the glottis or larynx, so as to interfere too much with respiration. A single introduction of a sound may be sufficient.

In case the œsophagus is very sensitive, the administration of a full opiate may precede the use of the instrument, and the opiate alone may enable the patient to swallow. Or, just before the operation, sufficient ether or chloroform may be inhaled to produce partial, but not complete, anæsthesia. Other narcotics, as belladonna, hyoscyamus, etc., have been advised; and also the smearing of the sound with extract of belladonna before using it. Morphine or atropine, or a combination of the two, may be used hypodermically. In hysterical cases, assafœtida, valerian, bromide of potassium, and other narcotic remedies, such as the general condition may indicate, should not be neglected.

Jaccoud and Homberger report cases cured by the simultaneous administration of belladonna and iodide of potassium.

The general health in all cases should receive attention; and all pathological conditions of the nerve-centres, or of other parts which by reflex action may operate as causes, must be special objects of treatment. A permanent cure cannot be expected until the nervous state and all other conditions upon which the symptom depends are mitigated or removed.

DISEASES OF THE ABDOMINAL DIGESTIVE ORGANS.

In pursuing the study of the Diseases of the Digestive System, we come to those within the abdomen. As there will be occasion to mention symptoms as located in different parts of the abdominal cavity, it will be important to bear in mind the different regions which have received particular names, and the organs situated in each of these regions. The surface of the abdomen has been artificially mapped out into nine unequal regions. This is done by drawing two horizontal lines across the abdomen—one from the lowest point to which the ribs descend on the one side to the other ; and the other line from the highest point in the crest of one iliac bone to the other. These are intersected by two other lines, one on each side, from the cartilage of the eighth rib above to the centre of Poupart's ligament below. The regions between the two vertical lines, commencing above, are respectively called the *epigastrium*, the *umbilical region*, and the *hypogastrium;* and the three on each side of these are called, beginning in like manner above, the *hypochondrium*, the *lumbar region*, and the *iliac region.*

The *epigastric* region is occupied mainly by a part of the stomach, most of the left and a portion of the right lobe of the liver, and more deeply by the hepatic vessels, the pancreas, the cœliac axis, and semilunar ganglia. The central regions below the epigastric—the *umbilical* and *hypogastric*—are occupied by the convolutions of the small intestines; but across the upper part of the umbilical extends the transverse colon, and into the hypogastric is pushed up the distended bladder; and the gravid uterus, as it rises out of the pelvis, occupies this region, and as pregnancy advances, fills a large portion of the abdomen. Deep in these regions are the lower part of the duodenum above (some of it being usually in the epigastrium), and the mesentery and its glands and vessels below. In the right hypochondrium is situated the lower edge of the right lobe of the liver, with the gall-bladder (the mass of the liver being in the concavity of the diaphragm), and the hepatic flexure of the colon ; and, deeper, most of the first and second part of the duodenum; and, deeper still, the upper part of the right kidney and the right suprarenal capsule.

The left *hypochondrium* contains the lower portion of the spleen (the rest of it being in the concavity of the diaphragm, with a portion of the stomach), the left portion of the stomach, the splenic flexure of the colon, and, deeper, the upper part of the left kidney and the corresponding suprarenal capsule. The *right lumbar region* contains the ascending colon, a part of the convolutions of the small intestines—and this, with the left, contains a very large part of these convolutions when the gravid uterus rises high in the abdomen—and farther back, or deeper, the lower part of the right kidney.

In the left lumbar region are situated the descending colon, convolutions of the small intestines, and, deeper, the lower portion of the left kidney.

In the *right iliac region* is the cæcum, and in the *left* the sigmoid flexure of the colon, and in both a small portion of the convolutions of the small intestines.

It is important to observe that the positions of the abdominal organs are not all fixed, but are more or less movable in health, and that in disease they are often greatly displaced.

The stomach occupies more or less space, according to the amount of its distention; and when it is the seat of a tumor—as a cancer of the pyloric end—it is apt to descend into the umbilical region, and possibly even lower.

The colon, in its transverse portion, may lie much lower than stated; and the liver, when enlarged or pushed down by distention of the cavity of the chest, as in effusions in the pleura, may occupy a position much lower.

On the contrary, it may be pushed up higher in the distention of the abdomen by the pregnant uterus, by an ovarian tumor or ascitic effusion; and the same may be said of the spleen.

The kidneys, too, by elongation and looseness of their attachments, may occupy different positions, and what is called a floating kidney is now and then observed.

Apart from the examination of the viscera in the pelvis, the examination of the abdomen proper includes the methods by *inspection*, *palpation*, *percussion*, and *auscultation*.

In investigating diseases of the organs of the abdomen, physical examinations are often of great importance, and should not be neglected.

Frequently much may be ascertained by simple inspection. The form is often changed, and sometimes characteristically, in different diseases. In great emaciation, in dysentery, and in some cases of cerebral disease, particularly in children, the abdomen is often flattened and even concave. On the other hand, in various diseases it is distended by dropsical effusions, by gaseous distention of the stomach and bowels, by enlargement of solid organs, or by the presence of morbid growths. Enlargement of the parietes by fat, or by anasarcous effusion, may be distinguished from distention of the abdominal cavity by the deep depression of the umbilicus in the former state, but not in the latter. When distention is from gases in the stomach or bowels, and the walls are thin, the outlines of the stomach and colon, and of the convolutions of the small intestines may be seen, and when from accumulations of fæcal matter in the colon, the outline of that organ may be distinctly observed. When the abdomen is moderately distended by fluid in the peritoneum, the patient in lying upon the back will have expansion of the abdomen laterally and distention in the lumbar regions. When in the upright position the distention will be more below, unless the intestines are distended at the same time. The distentions due to enlargement of solid organs, or to tumors, are seldom symmetrical. When the stomach is much distended, and the walls of the abdomen are thin, its peristaltic contractions are often very visible; and the same to a less extent may be said of the intestines. In inflammations or paralysis affecting the diaphragm, and in peritonitis, the abdominal walls are quiescent in respiration; whereas in obstructions to the free entrance of air into the upper part of the lungs, the respiratory movements are largely in the diaphragm, and the abdomen is correspondingly distended in inspiration, and contracted in expiration. Certain conditions of the parietes have their significance.

The eruptions of typhoid and typhus fevers are chiefly observed on the abdomen; and in tumors, in ascites, and in obstructions of the portal veins or vena cava, the external abdominal veins are generally dilated. The pointing of abscesses, the existence of parietal inflammation or tumors, or the presence of hernias will of course be perceptible to the eye. When ascites, tumors, or any other conditions have for some time largely distended the abdomen, the atrophic lines which so commonly follow child-bearing are apt to be present.

By *palpation* we observe many of the conditions noticed by inspection, with even more distinctness and precision, besides discovering different degrees of hardness, softness, elasticity, and resistance of the abdominal walls and the parts beneath; and can often determine the existence, the size, shape, character, and relation of tumors, and changes of the organs which the eye could not detect. Besides the fluctuation of fluids, the expansion, pulsations and thrill of aneurisms, the vibrations from certain inflammatory deposits, and the peristaltic movements of the stomach and bowels, the condition of their walls and the nature of their contents can often be observed by the sense of touch with a positiveness which no other sense can give.

When no resistance is offered and the walls of the abdomen are thin and flaccid, these manipulations are often very satisfactory ; but when the walls are thick and the muscles are rigid, as they unfortunately are apt to be, the conditions of the parts within are seriously obscured. Every means should be used, by exercise of the will of the patient, by a favorable position upon the back with the shoulders elevated, by taking advantage of respiratory movements, by taking time for excitement to subside, and sometimes under the relaxation of anæsthetics, to overcome the rigidity of the abdominal muscles in cases requiring careful investigation. The sensations communicated to the hands by different conditions will be referred to when describing those special states.

Percussion is another important method of physical examination. In striking in the usual method with the fingers or a percussing instrument and pleximeter over the stomach or intestines, containing as they usually do more or less gas, a resonant sound is produced. When striking in the same manner over a solid organ, as the liver or the spleen, especially when enlarged, or the bladder when distended with urine, a dull sound is produced. The stomach and intestinal resonance is quite different in character from that of the lungs ; is higher pitched and more drumlike, but varies in loudness, in pitch, and in quality, according to the size of the hollow organ, the amount of its distention with gas, and the absence of solid substance in its walls or its cavity ; and the resonance is also influenced by the thickness of the abdominal walls and the amount of fat in the omentum.

Thus, percussion over the stomach gives lower pitched and deeper sound than over an intestine ; and the colon, when empty of solid matter and distended, gives a much lower pitched and deeper note than a small intestine. When there is a general distention of the abdomen with gas, the sound is markedly drumlike or tympanitic, and the resonance great.

Though percussion for the most part is dull over the liver, yet when its thinner margin overlaps the distended stomach or the intestine, a blow of considerable force will elicit a sound more or less hollow. On the other hand, when an intestine lies over a solid part, as enlarged mesenteric glands, or the spleen, or a tumor, etc., a slight tap will give an intestinal sound, but by pressing the finger of the left hand, when used as a pleximeter, firmly upon the part, the intestine may be flattened down or pressed to one side, and a blow of some force will bring out the flat or dull sound. Careful practice will make one familiar with the sounds of different parts, and knowledge of great value as to the existence, position, source, and relations of tumors, or abnormal solid enlargements, can be obtained by this mode of examination. A slight tap, as with the nail of the middle finger in filliping, will give indications of the character of the parts immediately beneath the walls or the surface, while a stronger blow indicates the condition of deeper parts.

Auscultation is of less value in examining the abdomen in ordinary cases. Various gurgling and musical sounds may be heard by placing the stethoscope over the stomach or intestines, but they are of little significance in determining morbid or healthy conditions. Arterial murmurs produced by aneurisms, or by tumors pressing upon arteries, may be heard and are of importance; also venous murmurs in connection with the pregnant uterus, with various tumors, or dilated veins; and the fœtal heart may be heard, and friction sounds also when the peritoneum is thickened and roughened by inflammation and solid exudates.

The anatomy of the stomach and its associated organs, and the physiology of the digestive process, are presumed to be familiar to all who take up the study of their diseases.

The facts regarding the different parts of the digestive process, their relations to each other, and their absolute and relative importance, as observed and confirmed by modern scientific investigation, should be not only understood but borne in mind. The functions of mastication, insalivation, and deglutition; the mechanical motion of the stomach, its secretion of the digestive substances, their chemical action upon the food, the formation of peptones, their removal by dialysis, the passage of a part of the ingesta into the intestines, the action of the secretions from the pancreas, the liver, and the intestines themselves, which the food there meets with; the action of the liver upon those portions of the ingesta and their products carried into it, the course of the materials taken up by the lacteals and poured into the blood, and the disposal of the exuviæ—processes so important to be well performed, and so liable to derangement—must be kept in view in studying the diseases, organic or functional, of the digestive apparatus.

DISEASES OF THE STOMACH.

Diseases of the stomach are very common, and some of them are very obscure. It has been remarked that there is no subject about which our patients make so many inquiries, and about which we are able to tell them so little. The stomach has been declared by the great Poet of Nature, "the storehouse and workshop of the whole body," and from its relations through dependence of function and through sympathy to the rest of the system, its derangements must be of great importance.

With some exceptions its morbid conditions are not capable of being physically examined and distinguished as are diseases of the heart and lungs; the effusions that may be produced do not accumulate to afford signs, but are washed away, and the hyperæmia so common during the living processes of disease may, to a large extent, disappear after death, obscuring the evidences of pathological states usually afforded by *post-mortem* examinations. Besides, the gastric juice being a chemical agent, and during life being prevented from acting on the stomach itself by the neutralizing influence of the circulating blood, if freely present in the stomach after death, may digest its walls, producing softening or destruction of tissue, which may be mistaken for the erosion of poisons or the lesions of disease.

Even during life, in low conditions of the system with little blood and feeble circulation, if by reflex irritation or other causes much digestive fluid is in the stomach, its mucous surface may be chemically acted upon, and the traces of it seen immediately after death.

When such results are feared from the action of the gastric juice, alkalies and alcohol will neutralize its action and may be given for that purpose.

In cases of sudden death after a meal, especially in warm weather or if the body be in a warm place, the digestion of the stomach is likely to occur; and this must be remembered when, in cases of suspicion, an investigation is being made.

HYPERÆMIA.

The diseases of the stomach are divided into *organic* and *functional*. Of the diseases attended by perceptible structural changes, simple hyperæmia is among the mildest and the most common.

According to the observations of Beaumont and others, the quantity of blood in the vessels of the stomach during the process of normal digestion is much larger than when it is in a quiescent state; and under a moderate degree of irritation, from improper ingesta or reflex action, or from various other causes the amount very readily becomes excessive.

Hyperæmia here, as elsewhere, may be either active or passive. The active form results from irritating impressions, of whatever kind, upon the stomach—from improper ingesta, from "taking cold," from retention of effete matters in the system, from reflex irritation, from vicarious menstruation, etc.

The *passive* form is produced by obstruction of the return circulation, either through the liver, the heart, or the lungs. It arises from mechanical causes, and is chiefly venous, while the active is dependent more upon dynamical influences and is more arterial.

Any structural change or functional inactivity which causes obstruction of circulation through the liver, congests the portal system of vessels, and induces splenic, pancreatic, and intestinal as well as gastric hyperæmia. The spleen and stomach vary more in the amount of blood they contain than the other abdominal organs—the spleen especially, as it seems to be a reservoir for receiving much of the excess of blood in the portal system ; but the accumulation in this organ is not attended by the same consequences as that in the stomach.

In obstructive disease of the liver, as cirrhosis, congestion, inflammation, etc., or in functional inactivity of the organ, in valvular and other obstructive organic disease of the heart, in asthma, emphysema, and other diseases of the lungs interfering with circulation through them, the stomach suffers more or less from congestion. With this abnormal increase of blood its functional activity is modified and impaired ; there will be perversion of nutrition of its membrane, and consequent perversion of the secretion of the peptic glands, and modifications of the process of digestion.

There is a morbid susceptibility of the organ, and hemorrhage, inflammation, and even ulceration may follow. More or less dyspeptic symptoms are in such cases almost constant. Gastric uneasiness or distress, irregularity of the digestion of food, a coated tongue and unpleasant taste, sometimes constipation and sometimes diarrhœa, headache, lassitude, nausea, etc., may result. In various other diseases—in fevers, jaundice, Bright's disease, cholera, affections of the heart and lungs, etc.—gastric congestion is present. Simple hyperæmia is often merged into inflammation of the stomach, and the two conditions may be considered together.

GASTRITIS.

GASTRIC CATARRH.—ACUTE GASTRITIS.

Inflammation of the stomach is not an unfrequent condition. It often follows simple congestion or hyperæmia, and is produced by the same causes.

Hyperæmia is an element of inflammation ; and here, as elsewhere, the latter is the natural result and complement of the former.

In some cases of gastritis the inflammation is confined to the mucous surface, while in others the submucous tissue is involved.

A superficial inflammation of the mucous membrane presents the common characteristics of catarrhal or mucous phlegmasia, and may be either acute or chronic. Inflammation of the submucous tissue, or interstitial inflammation in the acute form, is called phlegmonous gastritis; and in the chronic form, with exudates organizing in the tissues, or hyperplasia of the tissues constituting thickening and contraction, has received the name of sclerosis of the stomach, or, by some, of gastric cirrhosis.

Toxic gastritis, or inflammation from the effects of powerful irritant poisons, differs from the more spontaneous inflammations. This always affects the mucous surface, and often deeper parts, depending in this respect upon the amount and character of the poisonous or irritating agent; and it differs in the depth, intensity, and special character of its lesions and in the symptoms presented, from the ordinary spontaneous or catarrhal form of disease.

Acute gastric catarrh is a very common disease, and has various forms and types. In its milder varieties it includes what are sometimes called "bilious attacks," or, among the French, "gastric embarrassment;" in its more intense forms it is called "gastric fever." Under the chronic varieties are a number of illy defined morbid states termed dyspepsias or inflammatory indigestions. No other terms, however, are necessary than acute and chronic gastritis, all others being of doubtful pathological propriety. The term catarrh, however, has come to be so generally used as signifying a superficial inflammation of a mucous membrane, that it has become proper from custom.

Etiology.—The causes of gastritis, as already stated, are similar to those producing hyperæmia, but of a more intense character, or operating upon a more susceptible organ.

Like other catarrhs, it is sometimes the result of taking cold; though in ordinary exposures the air-passages are more likely to be affected. Gastric catarrh, however, often coincides with other catarrhal affections, and, like them, may be produced by changes in the weather.

When such exposures and changes affect the system without the morbid action being specially localized, it is called "catarrhal fever." But at any season this gastric irritation and inflammation may be caused by improper ingesta, habitual or occasional.

Food insufficiently masticated, or of too high or too low a temperature, or in excessive quantities; or food of improper quality; the abuse of stews and fats, of cheese and pork, of game and lobsters, of mixed and too highly spiced dishes; or the ingestion of substances undergoing fermentation or putrefactive changes may cause the disease. A common cause is the use of alcoholic drinks, and the habitual use of other narcotics, as opium.

Sedentary habits, intense preoccupation, intellectual or emotional; irregularity in the time of meals; working immediately after eating, etc., are among the causes.

Symptomatic catarrh is very common in the course of most febrile diseases, exanthematous, malarial, etc.

Long abstinence, great insufficiency of food, or confinement to a single nutrient principle, as albumen or starch, may cause inflammation.

Dr. Chambers gives as the causes of catarrh of the stomach, fever, debility, the use of alcohol, previous attacks, as *predisposing*, and overloading the stomach, difficulties of digestion, decomposing food, changes of temperature, and exposure, as *exciting* causes.

Morbid Anatomy.—The anatomical changes are similar to those which occur in other catarrhal inflammations. There are hyperæmia, and the secretion of altered mucus, lymph, or pus; but these exudates pass off with other contents of the stomach. There are frequently spots of ecchymosis, sometimes erosions, and sometimes thickening and hardening or softening of the membrane. The secretion of proper gastric juice is greatly diminished or altogether arrested, and the reaction of the liquid in the stomach in severe cases is often alkaline.

Softening and blackening of the membrane and alterations of the consistence of the submucous tissue are often found, but are regarded by Jaccoud as post-mortem changes.

Symptoms.—When gastritis is dependent upon obstructed circulation through the liver, heart, or lungs, it usually comes on slowly and tends to be chronic; when dependent upon indigestion or alcoholism, as the cause here is also chronic, the onset is commonly gradual. In these cases, for several days before the occurrence of the more marked symptoms, the appetite will be diminished, digestion weak and painful; there will be disturbed sleep, inability to perform active work, general *malaise;* often severe frontal headache, aggravated by noise and light, and by sudden movements. The characteristic symptoms being now developed, there will be pain in the epigastrium, increased on pressure, the tongue coated with a whitish or yellowish fur, while the edges are red, and the papillæ are often seen; the tongue and buccal membrane are often congested and dry, perverting the taste; anorexia and thirst are decided; acid drinks are sometimes specially desired; nausea is very common; and vomiting is a frequent symptom.

The vomited matter, at first, is undigested food, and then mucus often tinged with bile. Sometimes there is much retching with little emesis, the matter ejected being streaked with blood. When caused by indigestion the vomiting may be copious, at first, of undigested alimentary substances undergoing fermentation, and this often gives rise to gases causing eructations or tympanitic distention. Sometimes constipation follows ; but if irritating substances pass into the intestines, a diarrhœa may result, accompanied by intestinal pain, the discharges being greenish, liquid, offensive, and irritating, but often followed, as may be the vomiting, by great relief.

In some of these cases there is but little fever, and after free evacuations all the symptoms may soon disappear.

When an acute gastritis is brought on by atmospheric influences or exposures, the access is usually abrupt and accompanied, or even preceded, by marked fever, often assuming a remittent type. The temperature may rise in the evening to 102° or 104°, but abates in the morning, the fever being accompanied by headache, pain in the stomach, and over the body generally, and often simulating more severe and specific fevers.

The skin may be quite hot and dry, but the nausea and vomiting are usually accompanied by fits of cutaneous moisture. When the fever is of a high grade, in excitable persons there may be delirium ; but this is quite unusual, the general excitement commonly not being great.

In any of the forms of severe acute gastritis, there are generally severe burning and shooting pains in the stomach and lower part of the chest, in front and between the shoulders, and often reflex pain in more distant parts of the chest. The gastric pain is accompanied with rigidity and retraction of the abdominal muscles.

There is aggravation of the pain on drawing a long breath, and consequently shallow and thoracic respiration ; and there may be rejection of whatever is taken into the stomach. Distressing hiccough is likely to occur ; and when all these symptoms are present, there is apt to be a small and rapid pulse, a tendency to faintness, and to collapse.

The severity of the inflammation influences more the continuance than the height of the fever. In the severe variety the fever may continue a week or more ; in the milder forms from this cause, it may terminate in two or three days, the crisis being accompanied by free evacuations, profuse sweating, and sometimes a herpetic eruption upon the lips. The stomach is left in a more or less enfeebled and irritated state, and becomes more liable to subsequent attacks from various causes. In some cases the disease is much more intense than in the ordinary cases described. The tongue may be very red and glazed, sometimes very dry and hard, and the fever, though not higher at first, is more persistent and protracted, and the prostration may be great. The pulse may become rapid and feeble, the countenance pinched and depressed, and, though even in these severe cases the prognosis is generally favorable, sinking and death from asthenia sometimes occur. In some cases, and especially in warm and moist climates where there are malarious influences, there is a free flow of bile into the stomach and intestines, with bilious vomiting and diarrhœa; the free discharges, whether spontaneous or induced by the proper mild measures, procuring much relief.

Diagnosis.—In *diagnosis* there is little difficulty in determining by the red tongue, the epigastric pain and *tenderness*, the nausea and vomiting, etc., the presence of gastric irritation and inflammation; but when preceded by a fever—by cephalagia and other general symptoms—it is not always easily distinguishable from a complication with typhoid and other essential fevers. But in simple gastritis the fever is higher on the first and second days than in ordinary cases of slowly approaching typhoid, and the morning remissions may be more marked. The fever accompanying simple gastric catarrh is more irregular in its progress than in typhoid; it does not go on with the same regular march; has not the characteristic eruption, or the gurgling in the cæcum; and it usually terminates either by crisis or lysis about, and often before, the end of the first week. It is, besides, more apt to be accompanied by constipation than diarrhœa, while the tendency to diarrhœa in typhoid is well marked. Some cases, however, will be obscure until time has developed their more positive characteristics.

The bilious form may be mistaken for catarrhal jaundice, hereafter to be described; but in the latter case the bile is retained rather than discharged, and the yellowness of the skin and eyes, and the dark color of the urine are much more marked. Complications, however, may exist, and catarrhal inflammation may occur in the stomach, the intestines, and the bile ducts at the same time, producing a mixture of gastric, intestinal, and icterode symptoms.

Prognosis.—In reference both to *prognosis* and treatment, the fact should be recognized that stomachs vary very much in their susceptibility and power of endurance, and in the degree of their sympathetic relations to the rest of the system.

Some stomachs will bear much, and others but little. With some large quantities of irritant poisons will be resisted or endured, while with others a large meal, a draught of cold water when the body is heated, or the taking of various medicines usually well borne, may produce much mischief.

Noxious matters in the blood, as in fevers, or Bright's disease, and other causes, may excite inflammation in the stomach, producing complications of gastritis, with various other affections.

The *prognosis* of simple gastritis is, on the whole, favorable; but, in some cases, depression and death may speedily occur, and in others decided structural changes may occur, and the disease may become protracted, with various results. When gastritis accompanies other diseases it often adds to their severity and danger.

Treatment.—The *treatment* of primary hyperæmia and catarrhal inflammation of the stomach is very simple.

If there be evidence of foul matters in the stomach, as undigested and fermenting articles of food, irritating secretions, or any kind of improper ingesta acting as a cause, evacuation should be promoted, but by the mildest means. Drinking freely of warm water, and tickling the throat to excite emesis, may be very effectual in washing out the stomach.

If there is acidity of the stomach, an alkali may be added to the water; this will render the matters in the stomach less irritating, and sometimes promotes emesis; but if it does not produce vomiting, it favors the downward passage of the contents, to be discharged by the bowels. The passages from the bowels should further be encouraged by enemas, if required, and sometimes by saline and alkaline laxatives.

Possibly an emetic of ipecacuanha, or perhaps better, apomorphia, used hypodermically, in the dose of from one twelfth to one sixth of a grain, may do more good by removing foul matter and inducing perspiration, than harm by any local irritating action. The evacuation and washing out of the stomach by means of the tube of the stomach pump acting as a siphon, or by the use of the pump itself, has lately been recommended and practiced in these and other more chronic cases where there are foul matters in the stomach. This process is regarded as less irritating and quite as effectual as that of exciting emesis. When the operation is carefully performed, so as not to produce mechanical injury, there can be no doubt of its usefulness in cases to which it is adapted. When the tube is used without the pump (and the objection to the latter is the possibility of drawing portions of the mucous membrane into the openings of the tube), after its introduction its outer end should be elevated, and water, simple or containing alkaline or antiseptic substances, should be poured into it, conveniently by the aid of a funnel, or by another tube from an elevated vessel, until the stomach is filled. The patient should then lie upon his side, and the tube, still filled with the fluid, should be lowered beneath the level of the body; being thus converted into a siphon, it will empty the stomach unless it becomes clogged by solid substances. In that case the pump may be applied, and in this manner the contents of the stomach may be evacuated.

A tube may now be found in the market more soft and pliable than the common tube of the stomach-pump, and which answers excellently as a siphon. After the contents are thus removed, the organ may be washed out by a weak alkaline solution, as of carbonate of soda. In ordinary practice such a procedure, though simple enough in itself, at first appears formidable to a patient, and will seldom be resorted to. Indeed, in most cases of gastritis, especially when produced by the common causes of acute catarrh, no special matters are in the stomach which require evacuation.

Even in cases dependent upon improper ingesta, the irritating materials have often passed from the stomach, either by vomiting or by the pylorus, before the physician is called, and there are the results of the irritation—the inflammation—to deal with, rather than the irritating causes.

In all such cases, and in all other cases after evacuation, rest of the organ is most important. Often for a day or two, or longer, no food may be taken into the stomach, and only cooling drinks. All alcoholics and spices should be entirely avoided, and when food becomes necessary, only the blandest articles, such as farinaceous substances thoroughly cooked and mingled with milk, should be used. Starchy foods, when properly prepared, tax most stomachs less than albuminous; and certain digestive changes go on in the stomach in starchy matters without the action of the gastric juice.

This simple treatment, giving the stomach and the whole system rest, the patient usually being kept in bed, may be sufficient to overcome the disease.

If, however, the inflammation be severe, more interference may be required. If the patient be plethoric a venesection may be useful, and not unfrequently leeches may afford relief. These measures are seldom required, as we have other means for abating inflammatory action.

Nothing, as a rule, will procure so much relief to the present suffering, or be so efficient in checking the inflammation, as proper doses of morphine.

A quarter of a grain, more or less, but sufficient to produce a decided anodyne effect, may be given by the stomach, dropped upon the root of the tongue with a sip of water after, or administered hypodermically, and repeated once in from three to six hours—the size of the dose and the frequency of the repetitions depending upon the susceptibility of the patient and the severity of the inflammation; but sufficient should be given to keep up a soothing, anodyne, and antiphlogistic effect. Ice-water may be used for drink, but not so much as to cause distress, nausea, and vomiting, as free quantities may

Mustard plasters or fomentations over the epigastrium will often procure relief; and if the case does not readily yield, a blister of cantharides should be applied.

This measure has been tested too often to leave a doubt as to its efficacy in such cases. If the ordinary cerate is used, the skin should be rubbed over with warm vinegar before it is applied, and the surface of the plaster, immediately before its application, should be smeared over with a few drops of the *oil of turpentine*. This, without interfering with the vesicating action, or the efficacy of the blister, will materially diminish the pain of its action, which is a matter of consequence in an irritable or sensitive patient.

Abstinence from food should here be practiced for a day or two, or more; and the bowels, if their condition so requires, should, as a rule at least, be acted upon by enemas, rather than laxatives by the stomach. If the inflammation still remains severe after the system requires nourishment, it should be given by enema. Broth, milk, or chemically digested foods in a liquid form, will be taken up from the bowels, and the system may be sustained almost indefinitely by intestinal alimentation. Should the secretions be much perverted, the tongue heavily coated, there can be little doubt of the usefulness of a few small doses of calomel, often not more than a grain or the fraction of a grain, combined with the morphine. Free doses of mercurials are objectionable on various accounts, and are quite unnecessary at least, and in many cases this article may be entirely dispensed with.

There are, however, cases where its effects are peculiarly beneficial; whether its action is explicable or not, its efficacy is amply confirmed by experience. In many cases carbonic acid water is grateful and useful, and sometimes effervescing mixtures in small doses often repeated, or mild neutral mixtures may do good. They must, however, be used in moderate quantities and in weak solution, and be at once discontinued when they produce uneasiness or discomfort in the stomach. In cases of gastric catarrh arising from a sudden checking of perspiration (taking cold), securing a free sweat by means of the warm bath, or some form of vapor bath, with the use of diaphoretics which will not irritate the stomach, will often be of the greatest service. Pilocarpin hypodermically will cause free perspiration without irritating the stomach, and may be worthy of a trial in some cases.

If much depression occurs, stimulants may be required; but as nearly all these articles are local irritants to an inflamed part, they must be administered, if at all, by enema or hypodermically.

If the inflammation extends to the peritoneal coat, it is likely to spread farther on that membrane, and is dangerous. Otherwise few cases of acute gastritis are fatal, though in exceptional instances, as already stated, rapid asthenia and death occur.

After the acute symptoms are past, and sometimes, as already stated, from the beginning, the treatment should be chiefly or entirely hygienic. Bland food only, and in moderation, should be taken for a considerable time; and if much debility remains, gentle tonics, such as small doses of quinine, or other vegetable bitters, or the milder preparations of iron; or if irritability of the stomach continues, moderate doses of bismuth with lupulin, and perhaps quinine, may be useful. As a rule, however, care as to diet and regimen will be all that will be required during convalescence.

CHRONIC GASTRITIS.—INFLAMMATORY DYSPEPSIA.

The more chronic cases of congestion and inflammation of the stomach often require a more varied course of management.

Special reference here must be had to the causes of the disease, as they are generally in continuance, keeping up the effect.

In these cases the symptoms are much less acute, but they are similar in character to those described. In some cases, often indeed, the appetite continues, and more food is taken than is digested. There is slowness and imperfection of this process.

There is often pain, particularly after meals, there is tenderness of the epigastrium, a furred tongue with red edges, and in long continued cases it becomes patchy and mapped—some parts being clean and smooth, others coated, rough, and sometimes fissured. The food not being readily digested, and a morbid mucus being secreted which readily undergoes fermentation and decomposition, various foul and irritating products result. Among these are lactic, acetic, carbonic, and butyric acids, causing heartburn, irritation, pain, distention, etc. Habitual constipation may follow; or there may be occasional attacks of diarrhœa from irritative materials passing into the intestines. We have, in short, all the symptoms of dyspepsia, with the addition of epigastric tenderness, and a redder tongue, and commonly with more or less rigidity of the abdominal muscles.

Pain in the stomach may be absent; there may be only a sense of warmth; or instead of a diminished appetite there may be a craving for food. But the taking of the food is often followed by pain, and sometimes vomiting, or at least by a sense of fullness and weight, and as gas is generally evolved, there is a tendency to eructations. The breath is usually offensive and sometimes fetid, and the eructations may have the odor of sulphureted hydrogen. The temperature is slightly elevated in many cases, but rarely exceeds 100°, and sometimes sensations of chilliness are experienced.

The elevation of temperature is commonly so slight that the disease is generally spoken of as apyretic; and for a considerable time in its gradual approach only the symptoms of ordinary dyspepsia appear, and pain even on pressure may be very moderate.

The distention of the stomach after meals is often perceptible, and this, with the increased sensibility, sometimes causes the patient to loosen his clothing. The heart is usually sympathetically disturbed more or less, and there is often palpitation after meals. When vomiting occurs an hour or two after meals, there is an abundance of mucus in the matters discharged, and the azotized foods are somewhat changed, but not in the physiological sense of digestion. This quite marked change in the food, but not the change of proper digestion, Jaccoud regards as peculiar to gastric catarrh; and he also states that "salivation is a constant symptom." In alcoholic catarrh the patient is very apt to vomit early in the morning. In catarrh accompanied by dilatation of the stomach, the vomited matter is found to contain sarcina ventriculi. As a result in protracted cases there is emaciation and mental as well as physical debility; melancholy and hypochondriasis are apt to occur.

This disease, when neglected, often lasts for months and years, and may end in chronic ulceration, in stenosis of the pylorus, or in death by marasmus. It is susceptible of cure as a rule, and the more recent the case, and the younger the patient, the more favorable. In the aged it is often obstinate, and may long remain stationary.

Diagnosis.—The diagnosis is to be arrived at by observing the symptoms so fully described. It may be mistaken for ulcer of the stomach, and possibly for atonic dyspepsia; but it is most liable to be mistaken for cancer.

The chief points of difference are that in cancer the first symptoms come on gradually, and are not due to causes of catarrh. The patient, in cancer, is past thirty-five, while in chronic catarrh he may be younger. The pains are more active and lancinating in cancer, and more likely to be present when the stomach is empty. Vomiting may occur in either, but, until cancer is advanced, it is less frequent and less watery and mucous.

In the early stage of cancer the breath is more pure, and catarrh of the mouth is less likely to be present. Cancer is progressive, the cancerous cachexia is developed, vomiting of blood and offensive matter, where the cancer is an open one, often occurs, and a tumor can usually be detected.

It may be difficult to distinguish it from ulcer of the stomach, but in a solitary ulcer the pain is more local and more distinctly referred to a particular point, there is more likely to be hemorrhage, and the case is more obstinate.

The tenderness on pressure, the red tongue, the slight elevation of temperature, will distinguish it from dyspepsia. In gastralgia the pain is more paroxysmal and less dependent upon the presence of food.

Treatment.—As already stated, the treatment is not as simple as in acute cases, but some of the same principles are applicable here.

Attention should at once be given to the removal of the cause. When due to obstructed circulation through the liver, the heart, or the lungs, every effort possible should be made to remove such obstruction.

Unloading of the congested state of the portal system is called for, and this is best done by cathartics; the salines, as a rule, are preferable, and in many cases should be repeatedly given. In all cases constipation must be overcome and prevented.

When the symptoms approach those that occur in the acute stage, the diet must be very limited and exceedingly bland; leeches to the epigastrium, and especially blisters, may be required, and morphine temporarily, or hyoscyamus, or belladonna, will often be demanded.

The chronic form of gastric catarrh, so often consequent upon the acute, should be prevented by prompt attention to the latter. In these cases Jaccoud thinks emetics have been too much neglected; and there are, doubtless, cases where either by emetics or the use of the siphon, washing out the stomach is useful. Leube states that among emetics in these cases, *apomorphia* in doses of from a twelfth to a sixth of a grain, used hypodermically, is to be preferred; it being efficient, and in this manner not irritating materially the stomach. In all cases the diet must receive particular attention. The food must be moderate in quantity, well masticated, easy of digestion, and unirritating.

Some will digest starchy foods best, while others do best with more azotized aliments. Each case must be observed by itself, as no rule will apply to all alike. In most cases, especially when symptoms are at all acute, a milk and farinaceous diet will be best borne.

When collections of gases occur from fermentation of undigested foods, antiseptics and absorbents, as small doses of creosote, carbolic or salicylic acid, the sulphites, or such absorbents as charcoal, magnesia, or bismuth will be useful. When there is deficiency in the acidity of the gastric juice, the mineral acids well diluted may be very useful, given in connection with the meals. The alkalies will tem porarily relieve the symptoms produced by acidity from the fermentation of food, and will facilitate the passage of these irritating matters from the stomach. If used habitually, however, they are apt to do more harm than good, and should be avoided, particularly when the digestive process is in progress, unless the fermentative changes are entirely superseding the natural digestive actions.

The management of these dyspeptic symptoms will be more particularly described under the head of Functional Derangements of the Stomach, to which the reader is referred.

But there is another set of measures applicable to these conditions of chronic gastritis which require attention. In chronic buccal and pharyngeal catarrh, in similar conditions of the bladder and conjunctivæ and other mucous surfaces, astringents and mild caustics locally acting as alteratives are often exceedingly useful.

In a similar manner, local alteratives may change favorably the conditions of the chronically inflamed mucous surface of the stomach. Among the articles operating in this way are nit. of silver, sulphate of copper, sulph. of iron, and sulph. of zinc, and the terebinthian and balsamic preparations. According to my observations the nitrate of silver and the terebinthian and balsamic preparations are most likely to be useful.

The nitrate of silver is best given in the form of a pill with opium or the extract of belladonna. The dose of the silver in these cases is from one fourth to three fourths, and sometimes as high as a grain, three times a day for a length of time. Often only a few doses should be given, and then suspended for a few days to observe its effects before they are renewed. It should always be given upon an empty stomach, and great care should be taken of the diet during its use.

If great irritability exists, or is produced by the silver, the patient may be fed for a day or two by the rectum, or a table-spoonful of milk, with a third or half the quantity of lime-water, may be given every hour, returning slowly to a more varied but still bland diet. Some prefer opium with the silver in quarter or half grain doses, more or less, while others choose extract of belladonna. Lebert and Jaccoud prefer the latter. The dose of a good article should be from one eighth to one half a grain.

As with its application to other inflamed surfaces, the nitrate of silver should not be continued too long, and its effects should be carefully observed.

I have found the oil of turpentine, given in emulsion with small doses of laudanum, very efficient in cases of this kind in changing the condition of the inflamed mucous surface. A tea-spoonful of the ordinary emulsion (see formula on page 274) may be given three or four times a day. This, not as powerful in its local action, may be continued for a longer time than the silver, and with less absolute restrictions as to diet. The balsam of copaiva, and other balsamic articles, in appropriate doses and preparations, may also be of service, and so may other alterative and astringent articles.

In the gastritis of drunkards deeper tissues are apt to be involved, and scattered superficial ulcerations are not unfrequent. These cases are to be treated by securing abstinence from the alcoholic poisoning (a matter often difficult to accomplish), and, if the disease has not gone too far, surprising improvement may result; but too often such changes have occurred as render every effort unavailing.

Jaccoud recommends in these cases a proper trial of the hydropathic method of treatment. In other cases as well, it may be worthy of trial.

The cures of these cases which often take place at the thermal and mineral springs, such as Vichy, Carlsbad, Ems, Kissingen, Baden-Baden, etc., so frequently resorted to on the continent of Europe, suggest the use of weak saline waters in free quantities as eliminatives and diluents. I have often seen patients improve on small doses of sulphate of soda, with still smaller quantities of the carbonate and of common salt, taken early in the morning in a large quantity of warm water, flavored with some aromatic substance if desired, and perhaps repeated once or twice a day, when other methods of treatment had been used with indifferent results.

SUBMUCOUS GASTRITIS.—PHLEGMONOUS INFLAMMATION OF THE WALLS OF THE STOMACH.

The acute form of suppurative inflammation of the coats of the stomach is very rare, and its clinical history is not distinctive. There is purulent infiltration of the submucous layers of the stomach, with thickening of the walls, the mucous membrane being hyperæmic and turgescent, sometimes presenting circumscribed ulcerations.

The muscular coat is changed in color, and is gelatiniform in consistence; the serous layer is opaque and injected, and covered with false membrane; sometimes adhesions and limitations occurring, and at other times more diffused peritoneal inflammation. Inflammation may occur also in the pleura and the pericardium.

The inflammation in the stomach itself may be diffused over a considerable part of the wall, or may be limited, forming abscesses in the submucous tissue. It has been studied mostly in fatal cases; but recovery is possible, the abscesses discharging into the stomach and cicatricial tissue following, which may contract and cause narrowing of the pyloric or cardiac orifice, or deformity of the body of the stomach.

The symptoms are of a severe character in acute cases—pain, tenderness, vomiting, fever, general prostration—and often death occurs by peritonitis or collapse.

In some cases of less acuteness, abscesses may form which will last for several months. As the abscesses form there will be partial abatement of the pain and tenderness, but distressing dyspeptic symptoms follow, with vomiting and a hectical fever; or signs of perforation are presented.

Differential Diagnosis.—It is to be distinguished from ordinary gastritis, gastro-enteritis, and circumscribed peritonitis by the fever and general symptoms being more severe, by the pain not being materially aggravated by the movements of the patient, and by the gastric region offering a feeling of very much increased resistance. Still, a positive diagnosis must be regarded as very difficult, and often the *post-mortem* examination alone will be conclusive.

This inflammation may be primary or secondary. The causes of the primary are obscure; the secondary variety is sometimes seen in typhoid fever, in variola, and especially in pyæmia, and then the local symptoms may be masked by the general disease.

Treatment.—The *treatment*, which is generally unsatisfactory, must be symptomatic, and will not differ materially from that for other forms of acute inflammation of the organ. It is thought by some late authorities that the early use of cold gives the most rational chance of success.

Interstitial Chronic Gastritis, or Plastic Inflammation of the Walls of the Stomach, Cirrhosis of the Stomach, is a more frequent disease. In this there is hyperplasia of the connective and muscular tissues, the infiltration of lymph and consequent thickening of the walls, which may become hard, firm, and contracted; or they may undergo degenerative processes. When fibroid tissue is formed in the coats of the stomach, like other false membrane, it contracts, often reducing the capacity of the stomach and causing stricture of its orifices. It may follow chronic catarrh of the stomach from ordinary causes, but it is commonly produced by alcoholism, and is intractable, and generally sooner or later fatal. If detected sufficiently early, and the alcohol is discontinued, with other appropriate treatment—soothing measures, eliminatives, and counter-irritation, etc.—the progress of the disease may sometimes be checked; but after a certain amount of advancement, it is fatal. Palliative symptomatic treatment will be required. Opiates, bismuth, turpentine, balsams, antacids, tonics, oxide of zinc, and great attention to diet, may afford relief. Iodide of potassium, with the view of preventing further deposits and of promoting absorption, may be indicated and borne in some cases, and, when it does not irritate the stomach, may be persevered with.

TOXIC GASTRITIS.

Chemical injuries and inflammation from corrosive poisons sometimes occur from accident or design, and require a brief notice.

Acids and alkalies, when swallowed in sufficient quantities and in concentrated forms, unite chemically with the tissues, destroying their vitality, and often their substance. When not in sufficient quantity, or concentrated enough to produce this effect, they excite inflammation, which may result in necrosis or ulceration, or, before such changes have time to occur, in the death of the patient. Various other articles, such as arsenious acid, phosphorus, the salts of silver, copper, mercury, etc., and different vegetable irritant poisons produce their effects by exciting inflammation.

The same agents are apt to act on the mouth, pharynx, and œsophagus, and they may retain their activity after leaving the stomach, and cause lesions of the intestines.

Each substance has its peculiarity of action and effects, which are described in works on Toxicology.

Diagnosis.—The *diagnosis* will be made by the circumstances of the attack and the time and manner of taking the poison. Symptoms usually occur suddenly in the midst of health. There is great pain, commonly vomiting, and generally there is more or less blood in the discharges; the pulse becomes small, skin cold, face often blue, countenance shrunken, etc., and death may be speedy. If the patient survives a sufficient length of time, symptoms of inflammation—gastric, intestinal, or peritoneal, or all together—occur, and death or recovery follows according to the severity of the poisonous impression and the power of endurance of the patient.

Treatment.—The *treatment* at first, aside from the free drinking of fluids, and the encouraging of vomiting, or the use of the stomach-pump, must be governed by the character of the poison, by a knowledge of its chemical qualities and the antidotes which may neutralize them, the details of which will not here be noticed.

The inflammation which follows is to be managed on general principles by the use of soothing and sustaining measures; opiates, demulcents, fomentations, etc., being the chief measures to which we should resort. In sustaining the patient, rectal alimentation is to be borne in mind. Whatever may be thought of the digestive power of the lower bowels, there is no question of their power of absorbing alimentary substances, when introduced into them, which have been already chemically digested out of the body, or mixed with digestive elements.

The experiments of Prof. Brown-Séquard are quite conclusive. By the use of a mixture of meat and pancreas, twelve to fourteen ounces of the meat to five or six ounces of the pancreas injected per day, he has kept patients not only alive but without loss of weight for weeks, in one case for more than three months. When the pancreas is quite fresh, the whole mixture, reduced to a pulpy mass in a mortar, and mixed with a fluid, is used, one half at a time, as an enema, and the digestion is so complete that no trace of the tissue of either substance can be found in the well-formed fæces which are passed.

The plan of Prof. Mayet, of Lyons, may be an improvement upon that of Prof. Brown-Séquard. He bruises the pancreas in a mortar with tepid water at about the temperature of 37° C., and then presses in a cloth the pulp obtained.

The liquid thus procured is triturated with the lean meat, which has been chopped and freed from fibrous parts, to which is added the yolk of an egg. This mixture is left to stand two hours, kept at the same temperature, and then thrown into the rectum, first cleared out by an oily enema. This digested material is thought to be more easily and more readily and completely absorbed than the mixture in which the fibre of the pancreas is retained.

In all forms of gastric inflammation, degeneration of the epithelium, the tubes, and of the secreting structure may occur.

These parts may become atrophied, or many of them may be destroyed, the secreting function being permanently affected. This will lead to weakness of digestion ever after. In such cases, perpetual care of the diet and mode of life will be required. Strict hygienic rules must be constantly observed.

Pepsin and mineral acids will for the time aid the digestive processes, and various tonics may be temporarily useful in giving more vigor to the system. Any intercurrent morbid states must, if possible, be removed ; and the palliation of the particular symptoms that may arise should be attempted.

The use of alcohol in such cases, though sometimes soothing sensations and giving temporary relief, quite as often—even at the time—produces disturbance; and for permanent and ultimate effects it cannot generally be recommended.

This expression may be contrary to some opinions of high authority, which are entitled to the most respectful consideration ; but I do not doubt that the science and experience of the future will sustain its correctness.

SIMPLE ULCER OF THE STOMACH.

Different names have been given to the disease now to be considered, such as chronic solitary ulcer, round ulcer, penetrating ulcer, etc., but all are not chronic, neither are they all solitary, round, or penetrating; though many of them have all these characteristics. The term simple ulcer is perhaps least objectionable.

Gastric ulcer is, however, a specimen of a peculiar kind of ulcer which may occur in the terminal part of the œsophagus and in the duodenum, as well as in the stomach, and is thought by Leube to be analogous to the corroding ulcer of the neck of the uterus. The destruction of substance in the more recent ulcers is greater at the surface than in deeper tissues; but in older ulcers the walls are more perpendicular. Generally they are nearly circular, though rarely irregular in form, and often look as if the superficial layers were clean cut as by a punch. The edges are generally hard and thickened, and in the older ones the inflammatory infiltration is marked. In recent cases it is much less so; and while in some there is a disposition to penetrate, in others exudates take place at the base, and the walls are thick and firm, or a more granular mass may give the appearance of a morbid growth. Beyond the immediate surrounding of the ulcer the mucous membrance is usually comparatively healthy, though in some cases a more extended gastric catarrh is present. The loss of tissue may involve the mucous membrane alone, or it may extend to the muscular coat or the peritoneum, when, if inflammatory adhesions to other parts have not been formed, perforation into the peritoneal cavity occurs with the usual result of a fatal peritonitis. Should such adhesion take place, the neighboring organ, as the pancreas, may form the base of the ulcer.

The size of the ulcer varies from that of a large pea (such as I have seen penetrating the duodenum), or even smaller (as one shown me by Prof. Cohnheim, which penetrated an artery and caused repeated and finally fatal hemorrhage), to one described by Cruveilhier, which was six and one half inches in length by three and one third in width.

The situation of the ulcer is more frequently upon the posterior than the anterior wall of the stomach, but it is not unfrequently in the pyloric region. Usually there is but a solitary ulcer, though in some cases there are more, and occasionally two or more run together, especially near the pylorus.

As met with in the cadaver, the ulcer is sometimes open and sometimes partially or completely cicatrized, the cicatrices being contracted and the stomach more or less deformed. The smaller cicatrizations, by the folding of the surrounding membrane, have a puckered and often radiated appearance, and when situated near the orifices, stenosis of the cardia or pylorus may be the result. The peristaltic movements, and the contraction and expansion of the stomach by food or gas tend to prevent adhesions, especially upon the lower curvature, and hence there is greater danger of perforation into the peritoneum of ulcers upon the anterior than the posterior portion of the organ.

When adhesions take place, and the liver, pancreas, or spleen forms the base of the ulcer, inflammation is likely to extend into the parenchyma of the organ, forming cavities or bands of adhesive matter; the course is uncertain, and cicatrization even then sometimes occurs. Adhesions to the walls of the abdomen have resulted, though very rarely, in an external fistula; while in other rare cases the diaphragm, the colon, and the lower part of the duodenum, have been penetrated, and communications established with these intestines. The cicatricial adhesions may undergo destructive changes and give way, and the same results as from primary penetration take place.

Hemorrhage is likely to occur, in ulcer of the stomach, from erosion of vessels; and when the ulceration is deep the larger vessels may be opened and the hemorrhage may be profuse and fatal. Sometimes the veins in the neighborhood of a comparatively superficial ulcer become varicose, and, as they are involved by the ulcerative process, afford a free flow of blood; but usually the hemorrhages are from smaller vessels, and are not profuse. In the case referred to as seen in Prof. Cohnheim's pathological laboratory, a penetrating ulcer, so small as only to admit of an ordinary-sized probe, extended obliquely through the mucous membrane, eroding the coats of a blood-vessel, and when the stomach became empty hemorrhage occurred; but when it was distended with food the bleeding was arrested. This continued for weeks, and at length the patient succumbed from loss of blood. The diagnosis was of course obscure, and the nature of the case was revealed only by the *post-mortem* examination.

Gastric ulcers are apt to be complicated with other diseased conditions, particularly of the circulatory and respiratory systems. *Post-mortem* examinations show them to be more frequent than clinical observation would lead us to suppose, as some cases are not marked with sufficiently distinctive symptoms to lead to a diagnosis during life.

Etiology.—The immediate pathological causes of these ulcers would seem to be diminished or interrupted circulation of blood in a portion of the stomach, resulting in diminished alkalinity in that situation, and diminished resistance to the action of the acid gastric juice, which consequently acts upon the tissue, commencing the destructive process. Anything which interferes with the circulation, or which increases the acidity of the gastric secretion, will contribute to the result.

This local stasis, or diminished circulation, may result from common catarrhal inflammation, from mechanical obstruction by atheromatous or fatty degeneration of the small vessels, or their obstruction by thromboses or emboli, or by similar obstruction of the larger gastric veins or of other portal vessels.

This form of ulceration may possibly originate in more superficial or aphthous ulcerations; the contractions and expansions of the stomach, and the corroding action of the gastric juice preventing healing, and carrying on the destructive process.

Among the more remote or predisposing causes are sex (it is more common in women than in men), age (oftener in advanced life), feebleness of constitution, excesses in eating or drinking, chlorosis, and especially tuberculosis and the puerperal state. Among the exciting causes as given by Jaccoud are chills, too hot drinks, too cold drinks when the body is heated, and especially the free use of spirituous liquors.

Respecting the influence of this last cause Jaccoud believes there is no doubt, and he thinks it operates by provoking acid fermentation in the contents of the stomach, which, added to the gastric secretion, overcomes the alkalinity of the blood circulating in the vessels.

Ulcers of this specific character in the duodenum are less frequent than in the stomach, and generally are found in the part nearest the pylorus; but they occur oftener in men than in women, and more frequently in middle life than nearer its extremes; and a form of ulceration of this intestine is caused by burns of the skin.

Symptoms.—The symptoms and progress of ulcers of the stomach vary in different cases, and the diagnosis is not unfrequently obscure.

A person in comparatively good health, with perhaps some slight and occasional pains in the stomach, but not such as to attract much attention, may be seized with a sudden and intense peritonitis, or with severe distress in the stomach with vomiting of blood, in either case resulting in death in a few hours, or in one, two, or three days.

In such sudden *cases*, on post-mortem examination, an ulcer will be found, probably not large in circumference, but penetrating deeply, having made its way through all the coats of the stomach, so as to allow its contents to pass into the peritoneal cavity; or having opened large vessels and involved the deeper tissues, producing the hemorrhage and the distress, and in both cases the collapse and the death of the patient.

Such an ulcer, though commonly in the stomach, may be found in the duodenum.

Another *rapid* or *acute variety* has the same termination, but is not as sudden, and before its conclusion has a collection of symptoms resembling those of toxic gastritis; and in either of these cases the question of poisoning may be raised, to be settled only by an autopsy.

By far the most common *variety* is the *chronic.* The chief characteristic symptoms here are pain and vomiting, the pain being limited to the location of the ulcer. When this is on the anterior surface the pain will be near the ensiform cartilage, and when on the posterior surface it is deep or at the back. This pain is notably increased by the ingestion of food, and generally by pressure, by tight clothing, or by active movements. Sometimes, in addition to this more constant pain, there are paroxysms of severe shooting pains producing intense agony. The most rational explanation of this severe suffering is that successive nerve filaments are attacked in the progress of the ulcer.

The vomiting, provoked by the same causes which produce the pain, often accompanies it. When the ulcer is near the cardia it may occur when food is taken, or soon after; while if at the pylorus, it is more apt to take place as the food is passing that orifice, some time after the meal. It may occur when the patient is fasting, and in that case the matter ejected consists of mucus often tinged with bile. The vomited matter not unfrequently contains blood. It may be comparatively fresh or clotted, or, when it has remained for some time in the stomach, it resembles coffee grounds.

Various dyspeptic symptoms are usually present, and constipation of the bowels is not unfrequent. In this chronic form the disease may continue almost indefinitely, at least for several years, remaining nearly stationary or increasing or diminishing in severity; and the symptoms often fluctuate, with marked aggravations and remissions. It may terminate in complete recovery, or in incomplete cure, with cicatrices and adhesions which interfere with the movements of the stomach, or produce more or less stenosis of the openings; and when obstructing the pylorus, lead to dilatation and muscular hypertrophy. It may also terminate in death by exhaustion, by hemorrhage, or by perforation.

Prognosis.—The prognosis in ulcer of the stomach is serious. Even where the ulcer heals there is a liability to relapses, and the cicatricial tissue, by its contraction, interferes with the function of the organ.

Diagnosis.—Ulcer of the stomach may be confounded with chronic gastritis, with cancer of the part, or with atonic dyspepsia. It is to be distinguished from gastritis by the more local character of the pain—persisting at a fixed point—by the greater obstinacy of the disease, and by the far more frequent occurrence of hemorrhage. It differs from cancer by its often being stationary and more protracted, while cancer is progressive and seldom continues longer than eighteen months after its detection. It is also distinguished by the absence of the cancerous cachexia, and of a tumor which in cancer is generally discoverable, especially as the disease becomes advanced. There is apt to be vomiting and hemorrhage in both diseases, but when the cancer becomes an open one the hemorrhage is more frequent, and very offensive matters are likely to be ejected. While ulcer may occur at any period of life, cancer very seldom occurs before thirty-five.

It is to be distinguished from functional dyspepsia by the more persistent character of the symptoms, by tenderness, by the pain being more definitely located, and more uniformly increased after meals, by more frequent vomiting, and by the occurrence of hemorrhage.

Hematemesis may be caused by a variety of other conditions, as, when there is a general tendency to hemorrhage in the system; in purpura, etc.; in malarial, yellow, and other fevers; in mechanical congestion from hepatic, cardiac, or pulmonary obstruction, as coincident with menstruation or as vicarious of it, and, finally, in cancer.

When these conditions are excluded, the vomiting of blood, especially if repeated, becomes an evidence of ulcer.

Treatment.—The treatment of ulcer of the stomach is chiefly dietetic. As far as possible, expansion of the stomach by food, drinks, or flatulency, must be prevented, and the object should be to give it a minimum of work, and of the lightest kind. The strictest diet must be observed. It must be moderate in quantity and bland in quality. Milk and thoroughly cooked farinaceous food, milk and lime-water, soft boiled eggs, and solutions of meat with pancreas, or meat digested with a strong acid solution of pepsin in a sealed vessel at a temperature higher than that of the body, thus reduced to a fine emulsion containing more or less of peptones, should be the diet. In the proper management there must be no interruption of the dietetic restrictions. A single coarse meal may undo the results of a long course of cure.

In addition to this dietetic plan, excessive acidity must, if possible, be prevented from accumulating and remaining in the stomach.

Alkalies, though often giving temporary relief, are on the whole of very questionable utility. It is impossible to regulate the quantity so as to neutralize only the excess of acid; and when more than that is given, it interferes with the digestion of the food, and the fermentation which is likely to follow often produces more acid—lactic, butyric, and carbonic—than existed before. Thus irritation of the stomach, flatulence, heartburn, etc., are increased. The occasional complete evacuation of the stomach of its accumulated contents is often here, as in gastritis, followed by much relief.

The stomach-pump or siphon has in these cases been used; but the possibility of irritating, or even penetrating the ulcer by the introduction of the tube, constitutes an objection to this mode of procedure in ordinary practice. Emetics are objectionable for obvious reasons. As a means of evacuating the stomach, weak saline solutions, taken warm in free quantities early in the morning, an hour or so before breakfast, are strongly recommended, particularly by Leube and other German writers. The waters of the saline thermal springs of Germany, especially Carlsbad, have long been resorted to, and often with marked success, in cases of chronic gastritis and ulcer. The ingredients in this water are sulphate of soda, carbonate of soda, and common salt—the first in much the larger quantity. The practice at the springs is to drink a free quantity—often from a pint to a quart of the water—in moderate amounts at a time, but repeated every few minutes until the requisite quantity is taken, no food being allowed for an hour or so after.

Before this time the solution, with other contents of the stomach, will have passed out of it, and soon after one or two watery stools are produced. This practice may be substantially imitated anywhere. A table-spoonful, more or less, of a mixture of sulphate of soda, carbonate of soda, and common salt, in the proportions of eight or ten parts of the first to one each of the last two, may be put into a pint of warm water, with any unirritating flavoring material that may be desired, and a quarter of it at a time may be drank once in a few minutes, until the whole is taken. The effect is essentially the same as that from drinking the water at the springs as above described. The quantity of the salt mixture may be varied according to the laxative effect, but the quantity of water is to remain the same—about a pint.

The success of this treatment, in connection with the proper diet, in ulcer of the stomach has been well attested; and the great relief which this remedy is capable of affording in subacute and chronic gastritis, with congestion and deficient secretion of the liver, I have often witnessed. The careful experiments of Dr. Rutherford to test the cholagogue effects of different substances have shown that, upon the animal the subject of the experiments, the sulphate of soda increased the flow of the bile more than any other of the salines.

With the increased secretion of the liver a more free circulation of blood through that organ occurs, and portal congestion is relieved. This effect may aid in relieving the congestion and other morbid conditions of the stomach.

Leube's method of treating gastric ulcer is as follows; and the plan commends itself to my judgment:

"The patient is confined to his bed during the course of treatment; hot poultices are applied to the abdomen (at night a cold compress, or ice, if hemorrhage be threatened), and active movements of the body are avoided as much as possible. During the first few days Carlsbad salt (one table-spoonful to a pint of lukewarm water), is given in the morning. If the salt fail to properly evacuate the stomach, the stomach-pump may be cautiously used, and the gastric surface washed with lukewarm water. The diet of the patient consists, at the start, of one pot of the beef solution per diem, corresponding to half a pound of beef, and to this I usually add, for breakfast and dinner, some milk and a few pieces of rusk which should not be swallowed until they have become thoroughly softened and masticated. The beef solution is taken pure, or it may be stirred in bouillon with a little of Liebig's extract of meat, and a little salt added or not, as desired. All the food should have a lukewarm temperature. After from two or three weeks, I place the patient upon a light diet, consisting of pigeon, chicken, purée of potatoes, thicker soups, wheat bread, etc.; and after eight days longer I gradually return to coarser food." (Ziemssen's Cyclopædia, vol. vii. p. 225.)

The only criticism I would make upon this is, that in many cases, at least, the restricted diet should be much longer continued, as the "return to coarser food" might arrest a healing process, or break up a recent cicatricial tissue. Entire abstinence from food by the stomach for two weeks, and rectal alimentation, may be required in some cases of gastric ulcer.

In addition, especially when this plan is not satisfactory in its results, the subnitrate of bismuth in doses of from five to ten grains (some advise it in much larger quantities), with or without a twelfth of a grain of morphine, three times a day, may be given. This remedy has long maintained a reputation in diseases of the stomach with irritation of the organ, and has undoubted virtues in many cases. The nitrate of silver has also been recommended and used with reference to a local alterative effect upon the ulcer; but it is not easy to understand how the small quantity that may be safely given can produce much local effect upon so small a part of the extended surface of the stomach. Besides, the common salt it would be almost sure to meet with in the stomach would soon neutralize its caustic properties. Still, there is testimony in its favor, and it may be tried in obstinate cases. Fuller doses than the sixth or a quarter of a grain may be ventured upon where other means have failed.

The turpentine emulsion (see formula) may exert a beneficial alterative effect, and where other means are unsuccessful it should have a trial. A proper dose would be from eight to fifteen drops, thoroughly emulsified with gum and sugar, with a few drops of laudanum, or a corresponding quantity of morphine, three or four times a day. Where the food is inclined to undergo fermentation changes, a drop or two of carbolic acid or of creosote may be added to each dose of the emulsion. Absorbents, such as charcoal, very finely powdered, and magnesia, may be used when gases are troublesome.

For the relief of the severe pain nothing is so efficient as morphine in appropriate doses, but where it disagrees, other narcotics, as hyoscyamus, belladonna, etc., may be substituted. Small doses of the muriated tinct. of iron, three or four drops in a wine-glassful of water, several times a day, are said to often relieve pain, and such use cannot be objectionable.

In some cases of tenderness and constant pain, counter-irritation with mustard, or, more effectual, a fly blister, affords relief. Where the pain and tenderness is local, fixed, and superficial, indicating that the anterior wall of the stomach is the seat of the ulcer, the wearing of a small ice bag over the part, or the application of a few leeches is advised.

Where there is much distention by gas, and it is not relieved by charcoal, the attempt may be cautiously made to relieve it by the stomach-pump or siphon.

The vomiting is most certainly relieved by the strict confinement to unirritating food. If this does not succeed, morphine, swallowing small pieces of ice, a drop or two, or more, of creosote in two or three table-spoonfuls of water, or a few drops of the tinct. of iodine in some mucilaginous vehicle may be tried. Both the morphine and the creosote are certainly, sometimes, quite efficient.

When the hematemesis occurs, the patient must be kept perfectly quiet upon his back, pieces of ice may be swallowed, and fifteen drops of a solution of ergotine (made by taking ergotine fifteen grains, water two drachms, and alcohol forty minims), may be injected hypodermically, and repeated if required. Local astringents, taken into the stomach, may also be used, such as acetate of lead with an opiate, tannic or gallic acid, and the astringent preparations of iron. There is a disposition in the profession to avoid these remedies, lest they produce irritation of the abraded surface of the ulcer; but in extreme cases the temptation to use them should not, perhaps, be resisted. Cold over the epigastrium may be applied, and warmth and mustard plaster to the extremities. Here, as in other cases of dangerous internal hemorrhages, the ligation of the extremities, so as to retain a larger amount of blood than normal in the veins, cannot fail, when properly managed, to contribute to the safety of the patient.

During the hemorrhage, and for a time after, all food should be abstained from, and if necessary the patient supported by nutrient enemas.

In all cases the bowels should be kept open. The artificial Carlsbad salt, in the cases to which it is adapted, will be sufficient; in other cases enemas may be required, while in others a laxative pill, composed chiefly of aloes and hyoscyamus, acting principally, as it will, on the large intestines, will effect the object without material irritation of the stomach.

In anæmic, and especially chlorotic patients, preparations of iron are important; and those should be selected which are least injurious in their effects upon the digestive organs. The lactate, pyrophosphate, etc., are eligible preparations.

When perforation occurs, free doses of opium, fomentations, absolute rest, abstinence from food by the stomach, and if great distention of the intestines or stomach is present, the rectal tube or the stomach tube, carefully used, may give exit to the gases. We can usually do nothing more than to mitigate suffering and induce euthanasia.

In many cases where the gastric ulcer heals, sequelæ are left which require treatment for a long time. Cicatricial contractions, adhesions of the stomach to other organs, cardialgia, defective secretion, diminished peristaltic motions, stricture of the cardia or pylorus, with their consequences, may follow, requiring much care.

Perpetual attention to the diet is of primary importance, and other measures will be required as each case may demand. The danger of relapses must be borne in mind, and proper precautions must be taken for their prevention.

Abscesses of the liver sometimes form adhesions with the stomach and open through into its cavity, forming a fistulous opening in its walls. There will be symptoms much like those of simple ulcer, but there will be the evidences of suppurative inflammation of the liver preceding. The treatment will be symptomatic, with care of diet. Hepatic abscesses will be treated of under diseases of the liver.

ULCER OF THE DUODENUM.

Symptoms and Treatment.—In *ulcer of the duodenum* the symptoms are more obscure, and the severest pain will be later after meals. Penetration here is apt to occur with even less warning than in case of ulcer of the stomach.

The treatment will be similar to that described as applicable in cases of gastric ulcer; though the diet need not be quite as strict. Only such food, however, should be allowed as will be readily changed into unirritating chyme.

Small scattered ulcers sometimes occur in the stomach and duodenum, with a general catarrhal or diffused inflammation of the mucous coat of the stomach.

This form of ulceration is sometimes found in alcoholism, and in certain other cachectic conditions of the system. These cases may be either acute or chronic. The symptoms are not particularly distinctive, but resemble those of solitary ulcer combined with gastritis. There will be pain, vomiting, tenderness, hemorrhage, etc. The pain, however, will not be as strictly localized as in solitary ulcer, and the symptoms will resemble more those of gastritis.

The treatment will not differ materially from that which has already been described for gastritis and solitary gastric ulcers.

TUMORS OF THE STOMACH.

Tumors, as distinguished from concretions, are neoplastic growths of tissue—are parts of the body and subject to its laws. Nutrition occurs in them all, but it is a modified nutrition in character, amount, or location.

All morbid growths have some analogy to some natural growth of tissue. A *heterologous* growth is one different from the tissue of the part in which it is found, but not necessarily entirely different from all normal structures. Some growths, however, have but a remote analogy to natural tissues, and such are likely to be more destructive in character; but all heterologous growths are not malignant. In all tumors there are several stages.

1st. A stage of irritation in which a morbid process commences—a modified nutrition and proliferation begins.

2d. More distinct granulation and cellulation takes place, and a tumor growth appears. In this embryonic or germinal state the structure is not distinctive.

3d. In this third stage "differentiation" takes place, and the distinctive features of particular tumors appear.

4th. A full development of specific characteristics occurs, and the tumor has attained its maturity, its adult existence.

5th. In this last stage retrogressive metamorphosis commences and progresses, such as fatty degeneration, softening, calcification, necrosis, breaking up and destruction, as in advanced cancer. Different tumors vary in the rapidity of their development and their life-period. The more benign tumors, as a rule, differ least from normal tissues, and some are nearly or quite as persistent in their continuance and structure as the natural parts. Others are shorter in their life-continuance, tend to destruction, and yet are inclined to spread, involving other parts in their own character and fate, and are therefore malignant.

Different tumors have different origins, and are divided into classes according to that origin. We have those which are—

1st. Exudations from the blood.

2d. Those derived from secretions retained in receptacles, dilating them, with cysts formed about them, as the sebaceous tumors.

3d. Proliferation of tissues, modified and increased, hyperplasias, such as occur in nodes, exostoses, and enlarged glands.

4th. Specific and often complex tumors, where growths occur which are more modified from the natural. To this class belong cancers, lupus, etc. The more juicy a tumor the more likely it is to spread, and the more vascular the more active.

There are various classes of particular tumors with more specific characters and names, which were referred to in the general pathological statements in the earlier part of this work.

Several varieties of these tumors occur in the walls of the stomach. Some of them are very rare, but all of them are possible. There are *fibroids, sarcomata, lipomata, papillomata, myomata, adenomata, tubercles,* and *carcinomata.* The kind which is of the chief and almost exclusive clinical importance is the last, as cancers of the stomach are much more frequent than any, and indeed all the rest, and they are the only variety which can with any precision be diagnosticated. It is well to know, however, that other tumors than cancers may occur in the stomach, so that in the absence of the cancerous cachexia and other characteristic signs, more hope may be entertained than otherwise would be possible when a tumor in the part is discovered.

CANCER OF THE STOMACH.

It would lead too far from the object of this work, and would occupy too much space, to enter into a full discussion of the minute pathology of the different forms of malignant or cancerous affections of the stomach, especially as statements upon various points, by recent pathologists, so widely differ.

It will be sufficient for the present purpose to state that gastric cancer is a neoplasm, having its origin, as some contend, in the cylindrical epithelia of the glands of the mucous membrane, proliferating in a downward direction, and growing more actively as the cancer elements reach the deeper parts. Whether it always commences in the epithelia of the glands of the mucous membrane, or sometimes in other elements of the parts as well, all the tissues in the location of the neoplasm sooner or later become involved, and according to the special forms of development taken by the stroma, or by the cancer cells, different varieties of gastric cancer, differing in their appearance and microscopical structure, are produced. Presenting many minuter differences in the particular character of their elements, and often shading off into each other and mixing their different qualities, three general forms have long been recognized, under which all the varieties may be included. These are:

1. Fibrous Cancer, or Scirrhus.
2. Medullary Cancer—Cerebriform or Soft Cancer.
3. Colloid or Gelatinous Cancer, or Alveolar Cancer.

The Scirrhus and Soft Cancers are distinguished from each other by the different degrees of development of the fibrous stroma and the comparative number of cancer cells. In the hard variety the fibres are much more abundant, while in the soft the cells compose the greater part of the substance, and are but loosely held together by a slight connective fibrous tissue. The third variety, or Colloid Cancer, is characterized by a change of the cancer cells themselves into a glue-like substance, giving the appearance and name to this form of the neoplasm.

A fibrous gastric cancer, by far the most common form of the disease, may appear as a distinct, firm, more or less rounded, but nodular tumor, in any part of the stomach walls, or as more diffused or in bands, producing thickening and contraction of the parts where situated. It is, however, most frequently located at or near the pyloric or cardiac opening—much oftener at the pyloric—and in that case is apt to present an annular thickening, constituting a dense mass, with nodules projecting internally, the proper coats of the stomach at the place being no longer distinguishable; and usually more or less contraction of the orifice takes place. The peritoneal coat of the stomach is the last to be involved in the cancerous degenerations, and then adhesions often take place to surrounding parts. In time ulceration, or a more rapid necrosis, occurs upon the internal surface of the mass, with the offensive and often bloody discharges characteristic of open cancer.

Microscopically this form of tumor shows a large development of connective tissue, with roundish, oblong, or caudated cancer cells, disposed in nests among the fibres.

Soft or Cerebriform Cancer is composed of nodular or roundish protuberances extending over a larger portion of the walls, and tending more readily to degenerate and break down into ulcers. Ragged tufts are often seen on the ulcerated surfaces, and on microscopical examination the cancer cells are found to predominate over the fibrous structure.

Colloid or Alveolar Cancer is characterized by such an arrangement of the connective tissue as to form unusually large spaces or alveoli, which, instead of being filled with cancer cells, have within them a gelatinous or mucous substance resembling soft glue, resulting from a metamorphosis of cancer cells. This form of cancer is juicy and inclined to spread, much more at least than the fibrous, and is usually disseminated quite diffusely; but it is slow in taking on the ulcerative process, is longer, therefore, in its continuance, and sometimes produces an enormous tumor involving the omentum and other parts. It is rare, not occurring in more than eight per cent. of the cases of gastric cancer; but, like all other varieties, it is persistent, and finally results in the death of the patient.

Villous, melanotic, and other varieties of cancer are spoken of, but they may all be placed in one or other of the three classes described.

Not unfrequently two or more of the different structures described are found in the same tumor, producing more or less irregularity in form and feel as to hardness and softness, affording, when present, a feature quite indicative of cancer. Not unfrequently, in the advanced stages of scirrhus, encephaloid nodules shoot up from the denuded surface, more vascular and far more cellular than the original tumor, and more readily taking on ulcerative and destructive processes.

Cancers of the stomach are generally primary, and are often limited to that organ; but they are sometimes secondary to cancerous formations elsewhere, and not unfrequently the *liver* and other organs become affected from extension of the cancer from the stomach. In some cases the secondary development is greater than the primary.

Various anatomical results follow gastric cancers. In the most common forms, when a scirrhus is situated at the pylorus, it sometimes becomes adherent to the neighboring parts, and is fixed and immovable. At other times no such adhesions form, and the weight of the tumor causes a descent of the stomach, and the tumor is often felt as low as the umbilicus, and sometimes it reaches even the pubis. As another result, a stricture is often formed at the pylorus, and from this may follow great distention of the stomach, which may cause the tumor to be situated in the right iliac region, and generally in these situations it is readily moved. These locations of the tumor are apt to lead to errors of diagnosis, which must be guarded against by a careful physical examination, and inquiry into the history of the case. It will usually be found that the tumor first appeared above, and gradually descended to the lower position.

When the cancer occurs at the cardiac orifice, it is not in the same manner detectable by physical examination, and dilatation of the stomach does not follow; and when situated in the body of the organ, it is not unfrequently at the lesser curvature, and often produces deformity—an hour-glass shape, or other modification of its form.

The muscular walls may be hypertrophied, or distended and attenuated; and the mucous membrane in the neighborhood of the cancer, and sometimes throughout more or less of its extent, usually presents evidences of chronic gastritis.

Cancer of the stomach may be complicated with round ulcer, and a disease commencing in ulceration, or other lesions may at length assume a cancerous form. (Wagner.)

It may also be complicated with diseases of other organs—with pneumonia, œdema of the lungs, pleurisy, thrombosis of the veins, etc., and particularly with *tuberculosis*.

Etiology.—The essential cause of cancer in the stomach, as in other situations, is obscure. Age has an influence, as it very seldom occurs before thirty-five, and its greatest frequency is about the fiftieth year. Sex has but little influence, as it is about as frequent in women as in men. Other lesions of the stomach may predispose to cancer, and various other conditions are thought to exert a causative influence. It is said to be rare in Oriental countries, and to be most common in the higher classes of society, and this may suggest the influence of alcoholics in producing it. It is more frequent in those who indulge in excesses at the table; and it is thought also to be favored by prolonged chagrin and depressing emotions; by excessive intellectual work, and a solitary and sedentary life; by defects of diet, and especially by alcoholism.

A predisposition — a constitutional cancerous tendency — often hereditary, is the most efficient cause.

The stomach is more subject to the occurrence of cancer than any other internal organ except the uterus, and this may be due to the fact that it is exposed to a greater variety of irritating influences than most other organs.

Symptoms, Course, and Diagnosis.—The symptoms, course, and diagnosis of this disease are now to be noticed. The subjective symptoms, though affording in some cases presumptive evidences of cancer of the stomach, are not diagnostic. In some cases of cancerous infiltration of the walls away from the openings, the lesion may not be discovered, because of the absence of any characteristic symptoms. In other cases a diagnosis can be made only by exclusion. There may be neither dyspepsia, vomiting, nor tumor present, but continuous emaciation and a cachectic state, with the peculiar fawn-yellow or ashy-pale color, languor, and weakness, with at length slight œdema, such as present themselves in other cases of cancer, and which are to be accounted for only on the supposition of the existence of that disease; and in such cases, when the cancer can be detected nowhere else, experience indicates the stomach as its location.

In the majority of cases, however, cancer has a more marked and characteristic course. There is an early period of dyspeptic symptoms, of various disorders of digestion, of pain and often vomiting. Cases of cancer of the stomach do not occur in early life, and have no relation to other diseases which might induce dyspeptic symptoms, and are accompanied usually by a sad, gloomy, irritable condition, a disposition to seek solitude and to brood over the disease. There is often, though not always, pain. It is sometimes lancinating, but may be more contusive, is localized in the epigastrium, increased on pressure and by food, but is less active than that from simple ulcer, though generally more continuous. The pain, however, is not sufficiently distinctive in character to be pathognomonic, notwithstanding all that is said about the peculiar "lancinating" pain of cancer.

The digestive disturbances are seldom absent, and are of importance in the diagnosis, but in themselves are scarcely distinguishable from those of chronic gastric catarrh. But with the slow and painful digestion, the pyrosis and loss of appetite, etc., there is uniformly and markedly more emaciation, progressive and persistent, than in simple catarrh.

Vomiting, though absent in some cases at first, is not unfrequently present at an early period; the matter thrown up is glairy and stringy when the patient is fasting, and sometimes is black and characteristic; and in either form, when occurring in advanced life in a person not given to alcoholism, is suspicious of cancer.

Hematemesis is a frequent but not a constant symptom, occurring, according to Bristowe, in forty-two per cent. of the cases; and when the hemorrhage is not rapid and profuse, the blood is of the coffee ground appearance.

Constipation as a rule is present, until breaking down of the cancer occurs, when diarrhœa is apt to be excited by the irritating discharges.

As the disease advances, the cachectic period arrives, not presenting all its characteristics at once, but coming on gradually, by emaciation, change of the color of the face to an ashy greenness, or a greenish pallor. A hectic fever, with scanty urine, and a moderate degree of dropsical effusion follow.

Generally—in about eighty per cent. of the cases—a tumor is discoverable, often of a distinct and circumscribed form, but sometimes more of a diffused infiltration. Scirrhus of the pylorus is generally distinctly felt, but its location varies; it develops slowly, and seldom obtains a large size.

The encephaloid form advances more rapidly, is apt to be more nodular or diffused in form, and is more elastic to the touch. The colloid is slower in its course, but usually more extensive in its diffusion, and often attains a large size. Percussion over the tumor does not give as flat a sound as over the liver, but still a degree of dullness is present, proportioned to its size and situation.

On palpation there is a degree of sensibility, not so much of the tumor itself as of its surroundings; and sometimes it pulsates from its position over an artery. The physical examination is best made when the stomach is empty.

The ordinary symptoms of cancer of the stomach—the gastric derangements, the vomiting, loss of strength, epigastric pain, and signs of a tumor—are modified by complications which occasionally take place. Narrowing of the pylorus may produce much distention of the stomach and hypertrophy of the walls; or, when situated near the cardia, there may be a more general contraction and narrowness of the organ.

Perforation, hemorrhage, extension of the growth to other parts, the kind of cancer, the rapidity and extent of its development, will further modify the symptoms presented.

The duration of a cancer of the stomach varies with the kind, the location, and the direction of its growth, and is from one to three, and in rare cases of colloid to five years from its incipiency. In a majority of cases it continues not far from one year to a year and a half from the time of presenting distinctive symptoms, but often much less. Its termination is in death, produced by exhaustion, and sometimes inanition, and more rarely by hemorrhage or perforation.

Treatment.—The treatment is symptomatic and palliative, and much as in simple ulcer and chronic gastritis. Exhaustion and inanition are to be retarded by careful feeding; the pain, vomiting, and hemorrhage to be managed as in ulcer; the bowels are to be kept open by appropriate means, and all special symptoms treated by remedies adapted to their character. A repetition of the particular measures, and a specification of all the details of management are unnecessary. Vomiting will often be allayed by a drop or two of creosote, or by carbolic acid, benzine, nitro-glycerine, bisulphide of carbon, and various other remedies. The use of anodynes will usually be required, and a proper selection so as to afford the most relief with the least unpleasant consequences should be made. Morphine is the most efficient for relieving pain, but it produces constipation, and it may be reserved for the latter stages, hyoscyamus, belladonna, and conium being used, while they are sufficient to relieve the suffering. Chloral hydrate may be called for to produce sleep.

Various specific remedies have been recommended and tried, with the hope of controlling the progress of the disease, of destroying, or at least checking, the cancerous growths, and overcoming the cachexia. No such specific has as yet been found, and all efforts at cure have so far proved abortive.

Some particular palliative remedies may be mentioned. The offensive putrefying changes which occur in open cancer, of the food taken as well as of the discharges from the ulcerated surfaces, may be checked by antiseptics; by carbolic acid, creosote, the sulphites, salicylic acid, etc., in proper doses.

Gases may be absorbed by charcoal or magnesia; occasionally the stomach, with care, may be washed out with advantage. Hemorrhage and perforation will require the same treatment as in ulcer; and the complications, of whatever character, must be met by appropriate means.

The hope of finding remedies for the cancerous state should not be abandoned, but at present the prospect seems remote and uncertain.

It is feared that the foregoing remark is literally true, notwithstanding the reports of Prof. John Clay, of Birmingham, England, and some others, of the success of Chian turpentine. This remedy, lately introduced into use, is alleged to destroy cancerous growths which are external, where the diagnosis is positive, and where the process of cure can be watched. Cancers of the uterus particularly are reported to have been cured, even when the treatment was commenced in advanced stages, and Prof. Clay reports that it is equally successful in cancer of the stomach.

The Chian turpentine is said to be more likely to be digested, and therefore more successful, when rubbed up with sulphur. The dose is from five to ten grains three times a day, and it must be persevered in for several months in order that its effects may be fully realized. Some, after a trial, have declared it useless; but Prof. Clay affirms that either a genuine article has not been used, or that it has not been properly prepared and administered, or has not been persevered in a sufficient length of time. Further experience is required to settle the question of its efficacy.

Prof. Bartholow says that "of all the remedial measures proposed there is no prescription which is so generally useful in these cases [in removing distressing symptoms; he does not claim the removal of the disease] as equal parts of pure carbolic acid and tincture of iodine, of which two drops may be administered in water three times a day."

Arsenic, in the form of Fowler's solution, has long had a reputation with some for retarding the growth of the epithelial form of cancer, and in small doses of one or two drops in water, three times a day, it is thought to have some power in allaying the pain. Prof. Bartholow advises the persistent use of both of the last two mentioned remedies, each at different hours of the day.

HEMORRHAGE OF THE STOMACH.—GASTRORRHAGIA.—HEMATEMESIS.

A flow of blood into the stomach is called gastrorrhagia; the vomiting of blood is called hematemesis; the former is the cause, and the latter the result; but this result does not always follow the cause.

Hemorrhage of the stomach may arise from a variety of causes. It has already been alluded to as caused by ulcer, by cancer, by intense congestion, and by catarrh of the mucous membrane.

The immediate or essential cause of hemorrhage of the stomach, as of other parts, is *a diminished power of resistance in the wall of the vessels as compared with the blood-pressure within their cavities.* The more remote causes producing this disproportion between the blood-pressure and the resistance are very various. Some produce increase of pressure, and others diminution of resistance. In a majority of cases of spontaneous hemorrhage both these conditions are present—diminished resistance and increased pressure—acting in combination.

When blood flows there is presumably a solution of continuity in the vessels; but recent investigations of Cohnheim seem to show that red blood corpuscles may pass through the coats of vessels in a manner similar to what is known to be the case with the leucocytes, without their rupture, by a simple diapedesis, and that circumscribed hemorrhagic erosions sometimes originate in this way.

There may be direct injuries to the vessels, mechanical or chemical, destroying their continuity, or so weakening them that the blood-pressure within effects a rupture.

There may be disease of the walls of the vessels, degenerations—fatty, atheromatous, or inflammatory—or there may be varices or aneurisms leading to rupture.

There may be venous stasis in the walls of the stomach, caused by obstructed circulation through the liver, as in cirrhosis, in phlebitis, in icterus, and in the pressure of hydatids, and by obstruction of circulation through the ascending vena cava, the heart, or lungs. There may be congestion arising from suppression of an habitual hemorrhoidal discharge, or of the catamenial flux, which may give rise to the loss of blood either by causing rupture of vessels, or by the pressure of the blood through their porous walls.

In new-born children hemorrhage of the stomach or intestines may occur, during the first few days of life, from feebleness of the heart's action and imperfect circulation through the lungs.

But *arterial* or active congestion may result in rupture of the walls of the capillaries, though this is much more rare ; and in many cases attributed to "lateral fluxion," it is quite possible that degeneration and weakening of the vessels may play a part in the causation.

In the *hemorrhagic diathesis*, in *chlorosis*, in *scorbutus*, in *yellow* and *malarial fevers*, and in *acute yellow atrophy of the liver*, gastric hemorrhage occurs, and may be due either to weakening in the coats of the vessels, to congestion and increased blood-pressure, to changes in the blood itself, or to some or all of the causes combined. In hemorrhages occurring in connection with chronic diseases of the spleen, the blood is changed in quality in a manner which may favor its loss ; but in such diseases of the spleen there is apt to be obstruction somewhere which causes portal congestion, and thus contributes to the result.

Blood appears in the stomach sometimes from other sources than its own vessels. In bleeding from the nose, the pharynx, or the lungs, the blood may be swallowed and accumulate in the stomach until vomiting is induced. It may be swallowed by the infant during birth, and give rise to the vomiting of blood, or to melænic passages from the bowels, leading to a false diagnosis in all these cases as to lesions in the stomach. Indeed, it is possible that in ulceration of the duodenum, or other portions of the upper intestines, blood may pass into the stomach from below.

When blood, from whatever source, remains in the stomach for any length of time, it is changed by the gastric juice, and is thrown up from the stomach, or passes from the bowels, of a dark color resembling coffee grounds as vomited, or tarry matters as passed by stools.

When hemorrhage takes place into the tissues of the stomach walls, instead of upon their surface, it produces what are now called *hemorrhagic erosions*. In these cases there is rupture of capillaries deeper in the tissues, favored undoubtedly by the contractions of the stomach in vomiting and during digestion, and the erosions of the tissues follow, aided by the action of the gastric secretion where stagnation is present. These erosions are more frequent in women about the period of the cessation of the menses.

A scale of causes of gastric hemorrhage, arranged according to their frequency, has been given. Aside from those produced by yellow fever, and some grave malarial fevers which are local in their prevalence, the causes said to be most frequent, in the order in which they are mentioned, are simple ulcer, cancer, hemorrhagic erosion and mechanical obstruction of the vessels, poisoning, wounds, foreign bodies, scorbutic and other dyscrasias, inflammation of the mucous membrane, rupture of large aneurisms, and vicarious hemorrhages.

Women more frequently vomit blood than men; but it is a less serious symptom with them, especially when it occurs about the menstrual period. It may occur at any age, but it is more frequent at certain periods with women, in consequence of its relations to the menstrual functions.

Mental excitement, strains and concussions of the body, and overdistention of the stomach, may act as exciting causes when a predisposition exists in the state of the vessels, the circulation, or the blood.

Morbid Anatomy.—The *anatomical lesions*, from what has been stated as to causation, will be seen to be various.

The only constant one is the presence of blood in the stomach, usually in a clotted form, either in larger masses or in smaller particles, suspended in liquid and of a blackish color. Ulcers, cancers, villous growths, erosions, hyperæmia, etc., may be found; but sometimes the vessels are so completely emptied as to present a pale and flaccid appearance of the coats of the stomach, and, in some cases, no rupture of vessels can be detected, the blood having passed through their unruptured coats. These cases must be exceedingly rare, as it is difficult to understand how sufficient blood to produce death should in this way be exuded.

Symptoms.—The *symptoms* of hemorrhage of the stomach will be slight or severe, according to the amount of blood lost and the accompanying conditions.

Traumatic and supplementary hemorrhages may occur in a state of previous health, but all others are consecutive phenomena, preceded by other pathological states, and usually by more or less marked symptoms.

In cases of medium intensity, which are the most frequent, gastrorrhagia is characterized at its onset by a feeling of weight, of fullness, and of heat in the epigastrium; and if the bleeding is considerable there will be nausea, a sense of depression and peculiar uneasiness; the pulse will be feeble; there will be pallor of the surface; syncope may occur; and on percussion, instead of the hollow stomach sound there is a degree of dullness, more or less pronounced, according to the amount of the hemorrhage.

As a rule, any considerable amount of blood in the stomach induces vomiting, and in the midst of the symptoms of depression, by an effort, a variable quantity of bloody liquid is ejected. The vomiting in some cases is accompanied by a convulsive cough, which may give an appearance of the blood coming from the lungs. If the blood is flowing rapidly, the vomiting will be the more frequently repeated, and the color will be brighter. In moderate cases the blood will be dark, partly liquid and partly clotted. If from the rupture of a large artery, the blood is arterial, and if speedily thrown up from a stomach previously empty, it will be fresh and comparatively florid.

Hematemesis of "coffee-ground" appearance and of an offensive odor is characteristic of open cancer; that of liquid blood and of small black clots is usually from stasis, and is capillary; when more florid or in large clots, it is usually from a simple ulcer, or from rupture of an aneurism. When the hemorrhage is slight the blood may be more or less digested, or may all pass off by the bowels, and in all cases, more or less is likely to pass by stool, which is then of a black color. It may in such cases be difficult to distinguish it from hemorrhage of the bowels.

In order to estimate the quantity lost, that passing from the bowels must be taken into the account.

Often a moderate hemorrhage from the stomach leaves an amount of physical and mental depression not to be accounted for by the mere loss of blood, but when it is supplementary to suppressed hemorrhoids, or vicarious of menstruation, it is usually well borne. When the cause is permanent, as is often the case, the hemorrhage is likely to recur, and even that from transient causes often leaves a greater liability to its recurrence.

Though in a majority of cases patients recover from the immediate effects of gastrorrhagia, yet death may follow from exhaustion, possibly from strangulation in the act of vomiting in the condition of great feebleness; and when hemorrhage is excessive death may occur without any evacuation. The loss of blood and the anæmia following may hasten to a fatal termination the course of other diseases.

Diagnosis.—The diagnosis of gastric hemorrhage is to be made by observing the phenomena already sufficiently described; and in distinguishing its causes, the previous history of the patient must be carefully noted.

The discharge of blood is the conclusive symptom; but this may be simulated, especially when passed from the bowels, by the black discharges caused by iron, by bismuth, by mercury, by vitiated bile, by charcoal, and by port wine. In all doubtful cases an examination by the microscope should be made; but when the blood has long continued in the alimentary canal the corpuscles may be destroyed and the blood pigment only remain. It is to be distinguished from hemorrhage from the lungs, by the mode of discharge, the character of the blood, the previous disease, the physical signs in the lungs, and the presence or absence of bloody expectoration after, and the discharge or not of blood from the bowels. A more particular comparison will be made when the subject of hæmoptysis is discussed.

Prognosis.—The prognosis will depend upon the amount of the bleeding, and particularly upon the cause and accompanying conditions. When it is supplementary or vicarious, and not excessive, it is not serious, and is often relieving; while a free hemorrhage may be fatal, and when caused by cancer, by cirrhosis of the liver, or by the ulceration of drunkards, the case is most unfavorable. When produced by temporary congestion it is nearly devoid of danger or of serious consequences.

Occasionally a case of free gastric hemorrhage occurs without previous or subsequent disease, so far as can be discovered, excepting such as may arise from the loss of blood. Drs. Chambers and Flint give accounts of such cases, and a few, not so extreme as some of those related, have come under my observation. However, cases where no other pathological state can be discovered are rare. When hemorrhage arises from a simple solitary ulcer, it is more grave, but may not be serious.

An exceedingly small ulcer, but one eroding an artery, producing scarcely any other symptoms than those caused by the hemorrhage, may, by the frequent occurrence and long continuance of the bleeding, cause death by anæmia. A case of this kind occurred at Leipsic, under the care of Prof. Wagner.

The patient for a long time had gastric hemorrhage occurring when the stomach was empty, but not when it was full, the cause of which could not be discovered. *Post-mortem* a very careful examination of the stomach was made, when a penetrating ulcer was found, so minute as to admit only a small-sized probe. The ulcer, penetrating obliquely through the mucous coat, and opening an artery beneath, gave rise to the bleeding, which was arrested, when the stomach was filled, by the lateral pressure upon the narrow fistulous canal. The recent specimen was shown me by Prof. Cohnheim, and a bristle was in the opening, indicating its course and extent. It was in the body of the stomach, some distance from either extremity, was not surrounded by any inflammatory blush, and the whole organ was unusually pale and anæmic.

As it occurs in fevers, gastric hemorrhage is seldom of itself dangerous, but often indicates a pathological condition which is so.

Treatment.—Supplementary or vicarious hemorrhage from the stomach, if not abundant, calls for no very active interference. Like the menstrual flow, it usually ceases spontaneously when the menstrual excitement is past. However, means should be resorted to for restoring the normal menstruation. In cases where the catamenia desert their natural channel, it will be well, says Dr. Watson, to endeavor to solicit the discharge toward its right direction by placing leeches upon the groins immediately before the period when the vicarious menstruation is expected, and by putting the feet at the same time in hot water, or even placing the patient in a warm hip bath. At the same time the stomach should be kept quiet, and iced drinks and other similar mild measures may be used.

In all other instances the cases should be carefully watched, and active interference is often demanded.

The object of treatment is to arrest the loss of blood, and to prevent the recurrence of the phenomena. To arrest the flow the patient should be placed in a recumbent position, and absolute rest should be enjoined. An opiate should be given at once to allay excitement and prevent peristaltic motion; and as blood is in the stomach, with which the medicine is liable to be commingled and rejected before absorption, morphine should be placed dry upon the tongue, and a teaspoonful or two of water taken after, or it may be administered hypodermically. This, with abstinence from food by the stomach until the danger is past, and the occasional swallowing of ice or ice-cold water, may be all that is required. If the bowels are costive they should be moved by an enema, and the patient may require support, for some time, by nourishing injections. As much as possible the stomach should be at rest, and no food should be taken into it. The utility and propriety of introducing astringents into the stomach, although formerly regarded as unquestionable, are at the present time *sub judice.* While still advised by most authors, some are of the opinion that they are as likely to produce irritation and increase the flow as to arrest or check it, and that, on the whole, the patients do as well or better without them.

As is the case with many other therapeutical questions, this is one difficult to decide by direct experiment, since the continuance of the flow is so variable and uncertain when left to itself. From the well-known physiological effects of the less irritating astringents, and from what we often witness of their power when applied to external bleeding surfaces under our inspection, I cannot doubt their capability of checking the flow from small vessels, and, as a rule, in severe and threatening cases they should be used. The danger, however, of producing irritation or inflammation, and leading later to a renewal of the hemorrhage, should be borne in mind; the least irritating should be selected, and in some cases, at least, they may be dispensed with entirely. There is not the same objection to the use of cold as to styptics, and a free use of ice, internally and externally, may without hesitation be resorted to. The effect of ergot in causing contraction of vessels and checking the flow of blood, especially from smaller vessels, is generally acknowledged; and when used hypodermically, no irritation to the stomach is produced. Fifteen drops of a solution of one part of *ergotine* to ten of water is advised, and it may be repeated as required. Pieces of ice may be swallowed and allowed to melt in the stomach, and ice bags or bladders, or cloths dipped in ice-water may be placed over the stomach and frequently renewed. The blood may be drawn to other parts of the body by rubefacients and cups; and a means more efficient than either of these, and free from serious objections, consists in ligating the extremities in such a manner as to compress the superficial veins without interfering with the circulation in the arteries, thus detaining a quantity of blood in their vessels and tissues, and preventing its loss. This simple process, or the use of Junot's boot, which acts on the same principle, has been too much overlooked and neglected by the profession in cases of hemorrhage and sudden congestions of internal organs.

With a given quantity of blood in the system, the more there is in one part the less there must be in others, and all the good effects of bleeding from the arm, which the fathers so much depended upon for checking internal hemorrhages, may be realized without the actual loss of blood and its after consequences. A much larger quantity of blood than the normal may be made to remain in the extremities by proper ligation, and striking relief to the congested internal organs may thus be produced. The anastomosis of the superficial with the deep veins prevents absolute stagnation of blood and injury from that cause; and after the hemorrhage is checked, the vessels closed, and the immediate danger passed, whether from hemorrhage or other fluxes, or from congestion, the blood can be allowed its free circulation, and is saved to the system.

The use of cold, the hypodermic injection of ergotine, and the ligation of the extremities may supersede the use, and thus avoid the irritating effects, of astringents by the stomach. Should these latter, however, be resorted to, the choice will be between alum, tannic or gallic acid, acetate of lead, the persulphate or pernitrate of iron, and some other mineral and vegetable astringents, given in sufficient doses to produce a local effect; and they will be most efficient when taken immediately after an act of vomiting, when the stomach is empty.

In each particular case the judgment of the practitioner must determine the necessity and extent of interference, and the particular means to be used. In extreme cases, where stimulants seem demanded, they must be given by the rectum, to avoid irritating the morbid stomach.

The after-treatment must be conducted on general principles, and the pathological conditions giving rise to the hemorrhage must receive the most careful attention.

Hemorrhage from the *intestines* will be marked by similar general symptoms, with the exception that vomiting will be absent, and more speedy and generally larger discharges of blood will take place by stool. The essential conditions of the flow of blood are the same, and the causes leading to it are various but in many respects similar, and the treatment is to be conducted on the same general principles. Details have been given for the management of intestinal hemorrhage in typhoid fever, and the subject may again be briefly referred to in connection with other diseases of the intestines.

GASTRIC OBSTRUCTION AND DILATATION.

In the account of inflammation of the deeper tissues of the stomach, of tumors and ulcerations of the organs, mention was made of obstructions at and near the pylorus, and the dilatation consequent upon them. The disease which most frequently causes stenosis of the pylorus is cancer. Next to this the cicatrices after ulceration ; next, hyperplasia of the fibroid tissue, with contraction and induration ; and, more rarely, polypoid and other tumors ; enlargement of the pancreas ; adhesions, and pressure from without.

Obstruction from any of these causes may be more or less complete, and the symptoms will be correspondingly severe. When the obstruction is only sufficient to cause delay in the passage of matters from the stomach, there will be a sense of fullness, and probably symptoms indicative of chemical changes occurring in the ingesta.

In such cases, especially if the obstruction be considerable, vomiting is likely to occur after intervals which allow of the accumulation of food—it may be from one to two or three days—and then large quantities will often be ejected. As the result of such obstruction, dilatation of the stomach sooner or later occurs. Such dilatation is sometimes very great. In one case a patient from a neighboring State was presented at my clinic, in whom the stomach occupied nearly the whole of the abdomen, and from the extraordinary thinness of the abdominal walls, the vermicular motions of the distended organ produced a very striking and singular phenomenon. In some cases the enlargement resembles pregnancy, or dropsy, or an ovarian tumor, but it is to be distinguished from these by a careful observation and comparison of the phenomena.

Symptoms.—The evidences of pyloric obstruction and great dilatation will be found in the free vomiting at considerable intervals, the egesta consisting of partially digested food undergoing chemical changes, and mingled often with mucus, and, in some cases of cancer, with "coffee-ground" materials, and frequently containing sarcinæ. The vomiting reduces the enlargement, relieves dyspnœa and other morbid sensations which may be caused by it, and brings the hollow tympanitic resonance on percussion peculiar to the stomach into a smaller space. The tympanitis, owing to the position of the fluid which is present with the gases in the stomach, will be observed over a larger and lower space, when the patient is lying upon the back than when in the erect position.

By auscultation over the stomach a ringing, hollow, amphoric sound may often be heard when liquids are swallowed, and an unusual splashing is often produced by movements of the body, resembling that caused by succussion in hydro-pneumothorax. Various manipulations with hollow sounds or siphon tubes have lately been resorted to, to determine the size of the stomach, the amount of the fluid within it, and the force of its contractions. When the tube first passes the cardiac orifice, pressure occurs and air is expelled. The distance the tube may be passed beyond this point will determine the extent of the distention; and by forcing air into the tube, the point where it reaches the fluid will be determined by the bubbling that may be heard when the ear or stethoscope is applied over the part.

The introduction of instruments should be conducted with great caution where an ulcer or open cancer is suspected. As stomach digestion is likely to be very imperfect, emaciation and debility follow. The bowels are usually constipated, the urine is apt to be scanty, and we have superadded to the symptoms those peculiar to the disease which causes the obstruction.

Dilatation of the stomach may be the result of weakness, paralysis, or of degenerative changes of the muscular coat without pyloric obstruction.

The affection is less grave, the dilatation is not generally as great, and the case is more likely to be remedied when pyloric obstruction does not exist.

Treatment.—In this, as in so many other gastric affections, the most important part of treatment is dietetic. Articles should be selected which are nourishing, most easily digested, least likely to produce gas, and which are found by experience to be best adapted to the case. The quantity should be governed by the amount the stomach is found capable of properly digesting. Digestion may be promoted by pepsin, hydrochloric acid, and bitter tonics. Remedies to increase the tone of the muscular fibres are indicated, particularly in cases dependent upon atony without obstruction. Strychnia or nux vomica, usually with small doses of quinine and iron, best fulfills this indication.

Mild saline laxatives, which promote the passage of the contents of the stomach into the intestines, and which keep the bowels open, sometimes produce relief.

When spontaneous vomiting does not occur, and the stomach is loaded and oppressed with accumulations, emesis may sometimes be easily induced by drinking warm water and tickling the throat. Where this does not succeed, the use of the stomach-pump or siphon tube, as recommended by Kussmaul and others, may be resorted to.

The contents of the stomach should not be too often removed, lest the system be deprived of nourishment. All that can be digested and appropriated should be allowed to remain.

The tonic effect of a galvanic current passed through the organ may be of service in the atonic cases, and a broad bandage accurately and comfortably applied to the abdomen may give useful mechanical support. Cold rubbing over the dilated stomach, together with a dry diet, has recently been advised.

If the obstruction is so great, and nutrition is so much interfered with as to cause danger of death from inanition, rectal alimentation becomes the last resort.

FUNCTIONAL DISEASES OF THE STOMACH.

By functional disease of the stomach is understood morbid changes, or perversion of action not produced by perceptible structural changes.

In the different organic diseases of the stomach we have been considering, the functions of the organ are more or less interfered with. Imperfect digestion, indigestion, dyspepsia or apepsia, difficulty or absence of the digestive process has been seen to have resulted.

But without any considerable disease of the stomach itself, without, at all events, perceptible structural disease, difficulty of digestion, at least of a temporary character, may occur.

An overmeal, improper articles of food, a sudden shock, a strong mental impression, excessive fatigue, great exposure, or a debauch, may arrest the process of digestion more or less perfectly, leading to various distressing symptoms. In such cases the food is likely to undergo fermentative processes in the stomach, developing very irritating materials, causing pain, gastralgia or colic, headache, nausea, vomiting, constipation and diarrhœa, and various other disturbances of the organism.

Temporary diseases of other organs, or various injuries to them, may arrest or render difficult the process of digestion, without the existence of any real, or at least permanent, trouble in the stomach.

Treatment.—The treatment of such cases would be suggested by each particular cause. For irritating articles in the stomach an emetic or the use of the stomach-pump would often be the best remedy. If such articles were in the intestines, a cathartic would be indicated. If acidity in the stomach was abundant and irritating, an alkali would procure relief. In the meantime, if the symptoms were distressing, soothing remedies, some warm drinks, a hot foot-bath, fomentations or a sinapism over the stomach, a dose of camphor or paregoric, a carminative, or a decided opiate would relieve the suffering, and give time for removing the causes.

In cases of overfatigue or shock, rest and anodynes are required.

In all cases remove the causes when they are recognizable and can be reached.

The stomach should have a period of comparative rest before a return to the ordinary diet.

DYSPEPSIA.

This term signifies difficulty of digestion, but as indicating a more distinct disease it may be more specifically expressed by the phrase atonic dyspepsia. This indicates a form of indigestion due to a depressed or enfeebled state of the stomach. The term dyspepsia is not, however, always used in this strictest sense, and some latitude to its signification is allowed.

Several special pathological causes may contribute to the result. Its proper pathogeny will require a latitude and freedom of statement. The subject is of a character that does not admit of as systematic treatment as some other diseases.

But derangements of digestion from functional disease of the stomach, more permanent than those temporary indigestions before referred to, may occur. Indeed diseases of this organ without perceptible structural changes are frequent, are often protracted, and produce great suffering. Many of these derangements are sympathetic, the result of morbid conditions of other parts. The stomach is an important centre of reflex impressions.

Irritation of the fauces is well known to produce vomiting; and so will sufficient irritation of the brain, the lungs, the liver, the kidneys, the uterus, and other parts. Less degrees of irritation of any of these parts may produce various other effects upon the functions of the stomach, particularly upon its secretions.

HYPERSECRETION.

By reflex action we have not only modifications of motor and sensory, but of circulatory, nutritive, and secretory functions ; indeed all functions may be changed by sympathetic or reflex impressions. The secretions of the stomach may be modified by such impressions, both in quality and quantity. Irritation of the lungs, for example, may cause an excessive or untimely secretion of the gastric fluid ; so that not unfrequently persons dying of consumption have so much of the gastric juice in the stomach at the time as to produce *post-mortem* digestion of its coats ; and before death the secretion may be so great as to cause acidity, irritation, "heart-burn," and pain. Normally the gastric juice is secreted in considerable quantities only when the stomach is stimulated by the presence of food, and when it is needed for its digestion.

From reflex impressions, and in some abnormal conditions of the stomach itself, or the nerves supplying it, there may be an untimely and therefore morbid secretion, producing the effects just mentioned, and still others.

Inflammatory and other diseases of the liver—the presence of gall-stones, of abscesses, etc.—sympathetically, and often severely, affect the stomach.

Inflammation of the kidneys, partly through sympathy, and partly from the retention of urea and other effete matters in the blood, deranges the functions of the stomach, and often produces an excess as well as other perversions of its secretion. In many diseases of the uterus the subjective symptoms are often more severe in the stomach than in the primary and essential seat of the disease, and so in some affections of the nerve-centres. When an abnormally free secretion of gastric juice is produced, the food may be readily digested, but with disturbance of sensations, "heart-burn," etc.; and the secretion continuing after the food is disposed of, acidity, irritation, uneasiness and pain, and often vomiting result. In all such cases a diagnosis of the pathological state should be made, the primary seat of the disease ascertained, and this should receive prompt attention ; but measures for palliating the gastric symptoms should not be neglected. Sometimes a local disease of the stomach, as ulcer or cancer, induces this hypersecretion.

Principles and items of treatment may be mentioned as we proceed in a statement of the pathogeny of this state.

The "heart-burn," irritation, and distress occurring from excessive secretion of acidity when the stomach is empty of food, will be promptly, though usually but temporarily, relieved by an alkali. Large doses will sometimes be required to neutralize all the acid present. The carbonates of soda or potash, calcined magnesia, solutions of caustic potash, lime-water, etc., are the articles indicated. Most of the salts produced by the acids of the stomach with these bases are laxative; and as constipation is a frequent condition in these cases, they fulfill another indication than that of neutralizing acids.

The salts of lime, on the contrary, are moderately astringent, and when there is too great a tendency to intestinal evacuations lime may be selected.

As a rule, the alkalies should be given after the food is digested—some two or three hours after a meal—as they might too effectually neutralize the gastric juice and interfere with digestion if given during the earlier stages of this process. Still, if the gastric secretion is in great excess, they may be given in more moderate quantities soon after meals. In the case of children and others whose diet is chiefly milk, lime-water may often be mingled with it to advantage.

The proportion may be varied in different cases, but usually there should be about one part of the lime-water to three of milk. The lime-water not only neutralizes acidity, but prevents the milk from coagulating too speedily and in too large masses, and it also exerts an astringent and alterative effect upon the peptic glands.

Other astringents may have an effect in diminishing the excessive secretion, and may be given some little time before meals. The subnitrate of bismuth is an absorbent, a gentle astringent, and a local anæsthetic, soothing gastric irritation and often acting very beneficially in cases of this kind. Given in doses of ten grains, more or less, before meals, its beneficial effects in these and various other stomach affections are often conspicuous. Vegetable astringents may also be useful.

It should be borne in mind, that in all the disturbances of the functions of the stomach from reflex irritation, treatment applied to that organ is only palliative, and should usually be temporary. The radical or curative treatment must be directed to the primary disease. Diseases of the brain, of the uterus and the ovaries, of the liver, or the kidneys, may require the principal attention, though not unfrequently the sufferings from the stomach are most conspicuous, and may divert attention from the real source of the mischief. The irritation of the first teething in children is a frequent source of derangement of the stomach and bowels, and both the condition of the gums and the dyspepsias and diarrhœas which follow demand attention. In adults there is more likely to be constipation than diarrhœa in reflex irritation of the stomach, and this requires to be overcome by various laxatives which may be indicated.

Excessive stomach secretion, though it may depend on disease of the stomach or the nerves supplying it, is generally reflex; and it is demanded of the physician that he should be particular in tracing out the cause and removing it.

A very important fact should be borne in mind, viz., that *morbid sympathies are more active in anæmia and debility.* Tonics are therefore in these cases often indicated, especially the preparations of iron when anæmia is present. Bismuth is supposed to have some tonic effect as well as an astringent and soothing action, and this with its power of checking excessive secretion, and especially of allaying irritation of the stomach, renders it a particularly useful article in many cases. It may often be combined with lupulin and quinine with advantage, and it is applicable to other conditions, as well as to those under consideration.[*]

DEFICIENT SECRETION.

But the gastric secretion is more frequently *deficient* than excessive, and deficiency and perversion of this secretion are the most common immediate or pathological causes of indigestion.

In catarrhal conditions of the stomach its secretions are variously perverted. There is often too much mucus enveloping the food and preventing the action of the digestive fluid upon it. In various morbid conditions of the blood the gastric fluid is perverted in quality as well as deficient in amount, and the same is true in most cases when the peptic glands are deranged in their activity, from whatever cause.

Etiology.—The causes of deficient and perverted gastric secretion are very numerous, embracing both physical and mental influences.

Whenever there is deficiency or perversion of the nutrition of the stomach, there will be a perversion of its secreting function. The conditions of healthy nutrition—a proper supply of healthy blood, a proper state of the part to be nourished, and a proper influence of the nervous system—are familiar. Any of these conditions may be defective in the case of the stomach, and when so, defective nutrition

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[*] ℞

Trisnitrate of Bismuth	grs. x
Lupulin	grs. ijss
Sulphate Quinine	gr. j
M.	

Sig.: Three times a day.

and defective secretion, and consequent defective stomach function, will follow.

In fevers and inflammations, in congestions and irritations, in excessive or deficient exercise, in improper alimentation, in excessive or deficient mental activity, in depressing passions—in short, in all conditions which unfavorably impress the system—the stomach suffers more or less, and hence its derangements are frequent.

Excesses in food, though generally deranging and ultimately enfeebling the stomach, may in vigorous conditions of the system develop its power and lead to gluttony. More food than is needed being digested and appropriated, plethora or obesity, with their consequences, may follow, while the stomach's power is not impaired. Commonly, however, the stomach suffers early from such excesses. Its powers overtaxed, its coats irritated, it suffers the "remorse" which violations of law, physical or moral, legitimately bring.

In some cases of diminished gastric secretion there is a deficiency of the peptic glands, either congenital or from previous disease.

Mental causes of deficient functional activity of the stomach are not unfrequent. Watchfulness, fear, anxiety, anger, remorse, excessive mental toil, excitement of any kind, when intense, may produce the effect.

Deficient gastric secretion and deficient muscular activity of the stomach necessarily result in deficient, slow, and imperfect digestion.

Symptoms.—There will be a sense of weight and uneasiness, often pain and cramps in the stomach, disturbed brain, heart, and liver actions, headache, confusion, disturbed sleep, palpitation, dyspnœa, yellow eyes and skin, costive bowels, deficient urine, and all the thousand morbid sensations and conditions which constitute the abnormalities of "*dyspepsia.*"

The uncomfortable sensations and general disturbance of the organism in this disease may be explained in different ways. The effects are produced on the nervous system, and may be by sympathetic or reflex action, or by the chemical changes producing morbid matters, such as sulphureted hydrogen, butyric acid, oxalic acid, an excess of lactic acid, etc., which are absorbed into the blood and carried to the tissues.

A certain amount of nervous energy is expended in the secretion of the digestive fluid, causing languor and depression of various functions; and then the presence in the stomach of food, and the products of its changes, makes an impression upon other parts, conveyed by sympathy, which changes the distribution of blood, and modifies the conditions of the nerve-centres and various organs. In morbid states the sympathetic effects are often severe, and a profound derangement of the whole nervous system occurs. The nerves of the stomach, especially, assume an abnormal state. The morbid condition may be confined almost exclusively to the nervous system, but derangement of the circulation, secretion, and motion, and further changes of digestion are likely to occur. The more the morbid condition is confined to the nerves, the greater the disproportion of the subjective symptoms (the morbid sensations of the patient) and the objective results of indigestion.

In some of these cases, the digestion of food is fairly well performed, and the body is properly nourished; but the sensations of the patient are very uncomfortable, and sooner or later the digestion is impaired. In time there will be wasting and marked deficiency of general power.

Food digested and appropriated is a necessary condition of *force.* Its deficiency is an ultimate deficiency of working power. While too much food is bad, too little may be worse. For the former there are natural remedies in vomiting, diarrhœas, free excretions, effusions, and hemorrhages. For the latter there are no such remedies. Nothing can take the place of food for any permanent effects. Food or failure are the alternatives. But food, taken into the stomach and not digested, undergoes changes from chemical action, which result in compounds of an irritating character, and produce a large portion of the distressing symptoms attending indigestion. These decomposing changes are excited by mucus and other morbid secretions of the stomach, and by the presence of *Torula Cerevisiæ* and *Sarcina Ventriculi,* which act as ferments.

The kind of fermentation and the resultant substances produced vary in different cases, according to the character of the food taken and the nature of the ferment. For the most part, lactic, acetic, oxalic, and butyric acid fermentations occur, but not unfrequently the alcoholic, and sometimes the putrefactive. As a result we have acidity in liquid and gaseous forms—lactic, acetic, butyric, and oxalic acids in solution as liquids, and carbonic acid in the gaseous form—besides sulphide of hydrogen and other gases and liquids, producing pyrosis, distention, pain, nausea and vomiting, eructations, foul breath, coated tongue, irregularity of the bowels—sometimes constipation, at other times diarrhœa—headache, dizziness, confusion, disturbed sleep, gloominess and depression, irregular action of the heart, morbid conditions of the urine; all these aid in the production of the protean sensations and phenomena characteristic of indigestion. The conditions that contribute to these fermentative changes are, delayed digestion; the abnormal catalytic effects of the mucous secretion of the stomach; retention of food, from obstruction of the pylorus; the taking of substances into the stomach which are undergoing fermentation; morbid conditions of the saliva and buccal secretions, producing improper changes in the starchy substances during mastication; imperfect mastication, from defective teeth or too great haste in taking food; improper articles of food and excessive quantities, particularly of saccharine and starchy compounds. While these conditions aid in producing the effect, the more essential cause is the deficiency of secretion of the normal gastric juice, and this, in its turn, is produced by the various causes, physical and mental, to which we have already alluded.

Acidity and its consequences—pyrosis, "heart-burn," etc.—are then dependent upon two distinct and opposite conditions, viz., hypersecretion of an acid gastric fluid; and a deficiency of that secretion, with consequent acid fermentative changes of the food.

In *curative treatment,* as the causative and the pathological states, rather than mere symptoms, are the bases of indications, it is important to distinguish between these conditions. In order to do this the history of the case and all the circumstances must be taken into the account; and to aid in making the distinction, the following table, taken from the work on "Diseases of the Stomach," by Dr. Wilson Fox, will be of service:

	Acidity from Fermentation.	Acidity from Hypersecretion.
Flatulence.	Common.	Rare.
Relation to Food.	Usually the acidity is at its height some hours after meals, and is more marked in proportion to the quantity of food taken, and inversely to the digestive power.	Occurs when the stomach is empty or soon after food is taken, and is often great in intensity after a small meal.
Pain.	Less severe.	More severe.
Vomiting.	Rarer. (?)	More common. (?)
The Vomited Matter.	Contains organic acids, and often torulæ and sarcinæ.	Commonly contains an excess of hydrochloric acid.

ACIDITY FROM FERMENTATION. (CONTINUED.)	ACIDITY FROM HYPERSECRETION. (CONTINUED.)
Relations to other Phenomena.	
Occurs in connection with causes which impede digestion.	Most common as a reflex symptom or in connection with nervous disturbance, or with ulcer or cancer of the stomach.

It must, however, be confessed that no one symptom by which these conditions of morbid acidity are accompanied is positively distinctive of either variety, and in some cases only an approximate diagnosis can be made ; but generally, by a proper consideration of all the facts, a sufficiently clear conclusion can be arrived at to furnish a rational guide to treatment. In deficiency of secretion from atonic conditions, as distinguished from irritative and especially inflammatory states, there are, (1.) A less degree of gastric uneasiness, and an absence of tenderness ; (2.) A simple deficiency of appetite, and comparative absence of thirst ; (3.) The absence of fever ; and (4.) A pale, broad, and flabby state of the tongue, instead of a red, dryish, hard state of this organ.

Treatment.—The principles of treatment in hypersecretion have already been stated.

For deficient secretion, as it is dependent upon such a variety of causes, various remedial measures will be required. Not only are the causes numerous and varied, but the results following—the particular symptoms produced—are various also, requiring modifications of the particular management for their relief.

Mere deficiency of gastric secretion, though often the chief element in indigestion, is not the only one. Diminished muscular action, diminished absorption, and a want of proper relations between the elements of the food and the conditions and activities of the stomach in various respects, may play a part in the morbid process, and should be considered in determining the course of treatment to be pursued. The principal object of treatment, however, is to increase the gastric secretion, but all the conditions must be taken into the account in prescribing definitely for a particular case.

Among the causes to be particularly remedied is the unsuitableness of food. It may not have the proper proportions of the different kinds of nutritious matter adapted to the powers of the stomach ; it may have too little or too much indigestible matter ; it may be improperly prepared ; may have undergone injurious changes ; may be imperfectly masticated and insalivated ; it may not have the substances capable of stimulating the gastric secretion, etc. ; and finally, there are the idiosyncrasies of some persons whose common digestion is good, but who cannot take certain articles without their "disagreeing" and producing unpleasant effects.

The taking of too much and too little food has already been spoken of as among the causes of indigestion, and requires only to be referred to in speaking of treatment.

Derangements of the movements of the stomach must not be overlooked in prescribing in indigestion. The motion effected by muscular contraction of the walls brings the food in contact with the different parts of the organ, and finally at the proper time causes its expulsion. Deficiences in this action may result in morbid changes, even when there is a sufficient amount of digestive fluid; or excessive peristaltic action may cause expulsion of the food from the stomach prematurely, and before the gastric juice has time to do its work.

The particular symptoms which require attention and alleviation in prescribing are acidity, heart-burn, flatulence, eructations, pain, nausea, vomiting, constipation, headache, and other disturbances of the nervous system, abnormalities of the urinary secretion, of the generative organs, of the circulation, of the respiration, of the skin, and of the general nutrition.

In the form of indigestion we are considering—that from deficiency of secretion produced by an atonic state—the leading course of *treatment* should be *tonic*. The indications are to improve the quality and circulation of the blood; to give tone and vigor to the system at large, and especially to the secreting tissues of the stomach, thereby increasing their functional activity; to temporarily aid the digestive process, by the addition of acid and peptic elements to the scanty gastric juice; and to palliate distressing symptoms which may be present.

The means for accomplishing these objects are very properly divided into hygienic, regimenal and dietetic, and medicinal. The first is the more important. Without proper attention to hygienic regulations, drugs will often be of little avail.

All the habits of the patient as affecting health must be inquired into, and, when wrong, corrected.

There must be regular hours for meals, giving the stomach its periods of labor and rest. In exceptional cases of great debility or exhaustion of the system, small quantities of food may be required often for a time; but as a rule, and as a more permanent practice, especially where patients are able to be up, meals should not be taken more than three or four times in the twenty-four hours, and always at regular intervals, the principal meals not being too late in the day.

The gastric secretion is more abundant at the usual hour of meals, when these meals are taken at regular periods. The stomach then has rested and its energies have been recuperated. Besides, the stomach has its habits, as have other organs, and it will act more readily at its proper established periods. As a rule, the breakfast and dinner should be fuller meals than the supper—the dinner being taken but little after midday. The system should not be exhausted by overexertion, physical or mental, when the meal is taken, and there should be comparative rest during the process of digestion. These rules are important, and in severe cases must be insisted upon.

There must, of course, be proper *food*, properly cooked, and taken in proper quantity. It should be nutritious, digestible, palatable, and adapted to the state of the stomach and wants of the system. It should be taken not too rapidly, should be thoroughly masticated and insalivated, and, if possible, taken with company and in a cheerful state of mind. Too much food is bad, but too little, if there is great deficiency, as already stated, is worse.

The propriety of these general directions is readily understood, and they are easily given. The details of the proper selection of food, of directions as to its amount, and the determination as to its special adaptation to each case, must, however, be matters of care, of judgment, and, to some extent, of experience. The proper preparation of food is a matter of great importance. In severe cases, various methods of subjecting animal food to artificial digestion, before being taken, may be of great service.

For ordinary cases of the protracted indigestions of the sedentary, the work of the stomach should not be made too light, but its powers should be conserved and developed by proper exercise. The same general principles are applicable as in conserving and developing muscular strength. In great muscular weakness much exertion is injurious; but after proper rest, moderate exercise, increasing as power increases, is essential to restoration. So with other activities of the system. So also with the stomach. Other favorable conditions must be secured, but the stomach must not be too much petted and kept in too great inaction if robust vigor is to be obtained. Great care in management is, however, in many cases essential. Bathing, frictions, open air, proper muscular exercise, and rest proportioned to the conditions are important. The *bowels must be regulated.* Constipation must be overcome. The importance of this cannot be exaggerated. With this object in view, a regular habit of daily evacuation at a particular hour should be established. An effort at securing a movement at a regular period should not be neglected. Through the efforts of the will, aided if necessary by kneading the abdomen, a constipated habit may often be overcome. A free draught of water early in the morning will often aid these efforts, and if a scruple or more of common salt be added to the water a laxative effect is more sure to follow. The use of bread made of unbolted flour, or the swallowing at night of a table-spoonful of bran, or a similar quantity of flaxseed whole, continued for a time may assist in regulating the bowels. In some cases a medicinal laxative may be required. The following pill often answers the indication admirably :

℞	Aloes Pure	ʒj
	Ext. Hyoscyamus	ʒj
	Alc. Ext. Nux Vom	grs. xij
	Pulv. Ipecac	grs. vj
	M.—Ft. pil. No. 30 or 60.	

One or two, more or less, should be given each night, continuously, until a regular habit is fully established.

Often, after a time, the quantity will need to be materially diminished, and only a sufficient amount of the medicine to produce a single satisfactory evacuation should, as a rule, be given. Sometimes, after a while, a sixth or a tenth part of a pill will suffice. A full, active cathartic, given at long and irregular intervals, is apt to be followed by greater constipation, but the nightly repetition of this compound very generally increases the tone of the intestines, and often establishes a regular habit, and then the medicine may be discontinued. Other laxatives may fulfill the indication equally well, and in some cases even better, but this particular combination is adapted to a larger number of cases than any other which I have used.

The fluid extract of cascara sagrada in doses of one quarter to one fluid drachm, or the solid extract in doses of from three to ten grains, often operates very satisfactorily in habitual constipation, but it is less certain in its effects, and less tonic in its action on the intestines, than the laxative pill above mentioned.

The Carlsbad salt, given in doses of from one to four drachms in a pint of warm water, an hour before breakfast, if a warm aromatic, as a little ginger, be added, will produce less debilitating effect than might be supposed. It will pass out of the stomach in a short time, procuring a loose evacuation in two or three hours, and only such quantity should be given as to produce that amount of action.

My usual prescription is as follows :

℞	Sulph. of Soda	℥jv
	Bicarb. of Soda	ʒjv
	Chloride of Sodium	ʒiij
	Pulv. Ginger	ʒij
	M.—Pulverize.	

A change of air, of scenery, or of employment, is often necessary. Motives and an object in life should be furnished for the aimless. Recreation and rest are quite as important for the anxious and overworked. Relief from the restraints of an artificial life; coming nearer to nature in rural employments, or in a temporary life in the woods, often produces most beneficial changes. With some, a sea-voyage has a favorable effect. Very often a change of climate is useful. It has been said that the worst place for an invalid is that in which he became ill; and in no disease is this remark nearer the truth than in this; in scarcely any is a change more likely to be beneficial, especially if accompanied with the further change from an indoor and sedentary to an outdoor and more active life.

The same general measures which tend to increase the gastric secretions will also tend to increase the tone and action of the muscular coat. Deficient secretion and deficient muscular activity depend upon similar causes and require similar remedies. Exercise, electricity, and nux vomica are particularly applicable to conditions of muscular atony, and these remedies increase the secreting function as well as the muscular tone.

The *medicines* indicated in atonic dyspepsia, as well as the hygienic measures, are those which tend to increase tone and power. General tonics and stomachic stimulants may materially aid the hygienic measures.

Among the tonics applicable, we have quinine, strychnine, salicin, iron, phosphorus, and the vegetable bitters generally. Columbo is thought by some to be peculiarly useful, from its general action on the system and its local effect upon the stomach. Stomachic stimulants, the spices, such as pepper, mustard, ginger, cardamom, etc., carefully used may be of temporary service in arousing the activities of the organ in strictly atonic cases, when there is a pale and flabby tongue, and no evidence of gastric irritation. Ipecacuanha in doses of from one quarter to one half a grain, or a grain, three times a day, is thought to have some peculiar power in exciting gastric secretion, and is often useful in these cases.

The mineral acids—hydrochloric, nitric, and phosphoric—are often of decided use, not only acting as tonics, but by their chemical effects supplying a deficiency in the gastric secretion, and directly aiding the process of digestion. Lactic acid fulfills a similar indication.

Pepsin and pancreatin directly supply elements which aid digestive processes, and when good articles are secured, are of decided temporary benefit in bridging over a period of stomach inaction, aiding the nutrition of the stomach and the restoration of its secreting power.

Ten grains of pepsin at meal-time will often produce a very sensible effect. The extract of malt—the diastase which it contains—also aids digestive processes, and has its places of usefulness. Strychnia is in some cases particularly useful. It seems to act strongly on the vaso-motor centres, and give tone to the circulation, and particularly to muscular activity.

Various compound prescriptions will be found adapted to particular cases. The elixir of the phosphate of iron, quinine, and strychnine, with or without the addition of phosphoric acid, will often be specially useful. All the measures which give tone to the stomach and increase its secreting function tend to prevent the fermentative processes in the food, and the numerous distressing symptoms arising from that cause. In the absence of the stronger influence of the gastric juice and its chemical aids, fermentative processes are excited by changed mucus and by torulæ and sarcinæ, acting by catalysis. These changes are capable of being checked by various agents which destroy these ferments. Carbolic acid, creosote, and the sulphites are most efficient for this purpose. They may be given in sufficient quantity to check these processes without irritating the stomach, and as palliative measures may be very useful. The stomach-pump or siphon, emetics, and cathartics, will of course clear away irritating materials—the acids and the putrefying matters, the results of these fermentative changes in the food—while alkalies will neutralize the acidity, and pulverized charcoal will absorb gases and other foul matters in the stomach, as it is well known to do out of it.

When the alcoholic fermentation occurs, carbonic acid is evolved, producing distention, flatulency, and eructations, and this gas may cause effervescence in the vomited matters. This form of fermentation is promoted by taking into the stomach new cider, wine, or beer undergoing the fermentative process. New bread and preserves may have fermentative changes going on within them, and these articles, as well as many vegetables and saccharine substances, readily take on fermentative changes which cause heart-burn, pain, and all the symptoms attendant upon these fermentations of food.

Oxalæmia or oxaluria, manifested by its peculiar symptoms, is not an unfrequent condition in these digestive derangements, a state to be more particularly noticed in another connection.

Alkalies, in acidity from decomposition of food as well as from hypersecretion, afford temporary relief; but long continued they are debilitating to the stomach, are apt to weaken or neutralize the gastric juice, and, unless very carefully managed as to the time of administration and the quantity given, lead by an interference with digestion to an aggravation or production of the conditions they are given to relieve. Tonics—quinine, salicin, columbo, nux vomica, and various bitters—or the *mineral acids*, given with or soon after the taking of food, thus stimulating the secretion of gastric fluid and aiding the digestive process, are indicated; and alkalies are to be given only when the stomach has had time to digest the food, but has failed to do so; and when the acids from fermentation are remaining, and are producing severe symptoms from which the patient demands relief. When acids are given at meal-time, alkalies some hours after may sometimes be justified and required; but the free, repeated, and indiscriminate use of alkalies in these cases must be condemned. Bismuth and charcoal will often give relief, without interfering with digestion. Magnesia and lime-water are less objectionable than the stronger alkalies, soda and potash.

The removal or destruction of torulæ and sarcinæ will often prevent the fermentative changes; and with this view the thorough washing out of the stomach by means of the stomach-pump, the siphon, or by an emetic, and the administration of these antiseptics, are often indicated.

The production of butyric acid, and other irritating materials, sometimes excites spontaneous vomiting; or these substances passing into the intestines may produce diarrhœa; or a brisk attack of cholera morbus may occur, clearing away the offending materials and producing relief. Too much irritation may sometimes be caused in these cases by emetics; but Kussmaul's plan of washing out the stomach in a certain group of cases is undoubtedly admirable.

The *relations of the stomach and liver* are important, and many of the diseases of the stomach are associated with those of the liver. Bile in excess in the liver or intestines, and especially if regurgitating into the stomach, produces uncomfortable symptoms, and great relief is often obtained by purging it away. Occasional doses of a mild mercurial, as a blue pill, or mercury with chalk, or the mild chloride, followed by a saline cathartic, from their effects upon the stomach, the intestines, and the liver, will procure relief which nothing else will give.

These derangements, or bilious attacks as they are often and not improperly called, occur frequently with some, causing headache, malaise, foul tongue, etc.; and the passing off of accumulated secretions by catharsis affords great relief.

Much fatty food, or a combination of fatty, saccharine, and albuminous articles in "rich" dishes, not only deranges the stomach but the liver also. The remedies for these "bilious" attacks are a plain and simple diet, with occasional cholagogues and laxatives, mercurials, salines, alkalies, etc.

The question of the *use of alcohol* in cases of dyspepsia is one of very great scientific and professional importance, besides having relations still broader which affect profoundly the general interests of society. In a work of this kind, however, we have only to do with its scientific and medical aspects, and the action of the article should be discussed in the same manner as that of opium, mercury, alkalies, or any other medicinal substance.

Respecting its use in those cases of indigestion dependent upon or accompanied with organic disease, congestion, inflammatory or ulcerative conditions, there is a general agreement as to its inutility and generally injurious effects.

Respecting its effects in cases of functional derangement, in atonic dyspepsia, where there is a deficiency of gastric secretion, there is not the same uniformity of opinion. The text-books abound in recommendations of its use in moderate quantities as an exciter of the secretions of the stomach, and the sensations of patients are appealed to as evidences of its useful effects. There are many, however, who deny (and, it must be conceded, on good grounds) the conclusiveness of sensations as to the ultimate utility of any of the narcotic substances, especially where a habit in their use is established; and they appeal to more scientific facts and principles, and to a broader observation and experience, to determine the beneficial or injurious action of this article in these affections. On this, as upon other controverted subjects, extreme views are apt to be taken, and an unprejudiced consideration of all the facts will be necessary in arriving at the truth. It must be regarded as a fact that the introduction of alcohol into the stomach causes relaxation of the blood-vessels and the consequent increase of the quantity of blood in the coats of the viscus. In some cases of anæmia of the organ this may cause an increase of the gastric secretion, and thus, for the time, result in promoting the digestive process. The alcohol, however, while it remains in any degree of concentration in the stomach, has the direct effect of coagulating albumen and of diminishing or neutralizing the action of the gastric juice, and thus interfering with digestion. Even when it has this directly injurious effect, which may be unnoticed when only a small quantity is present, it nevertheless, by its narcotic or anodyne action, often diminishes uncomfortable sensations, especially with those accustomed to its use; and it thus produces a false appearance of aiding digestion.

This point, in my opinion, should be particularly emphasized. It can hardly be claimed that the frequent or habitual use of opium or tobacco is useful in dyspepsia of the atonic character we have been considering. But the habitual user of either of these articles, particularly of opium, is wonderfully relieved in his sensations, and is stimulated to the performance of his various functions, by the taking of his accustomed dose. When the time for this has passed by, and the accustomed narcotic impression is not made, he is not only wretched in his sensations, but his various functions, including digestion, are wonderfully deranged. His heart's action will often be feeble and irregular, his appetite will be lost, his digestion often suspended or greatly diminished, and his muscular strength prostrated. The taking of the poison which has produced these effects restores all, for the time being, to a vastly improved if not healthy state. It is much the same with the habitual user of tobacco. May not, indeed *does* not, the same principle apply in the use of the narcotic or stimulant (whatever it be called) alcohol ?

Its action upon those habituated and those not habituated to its use is certainly quite different in various respects. The habitual user of alcohol has his feeling of strength and his power of exertion sensibly improved by his accustomed potation. The habitual abstainer is, on the other hand, weakened by a similar dose.

The frequent assertion that alcohol has power to increase the action of the heart, must be taken with exceptions, perhaps more numerous than the rule. When it is given to a healthy person unaccustomed to its use, the sphygmograph does not show an increase in force of the heart's action. Given to one accustomed to its use, or suffering from certain conditions of shock, or of severe disease, it does, sometimes at least, increase the force of the heart. Given to a person in health and unaccustomed to its use, it reduces the temperature. Given to one accustomed to its use, especially to its large use, it does not diminish the temperature. (Ringer.) May not these facts account for the very contradictory results of experiments which are reported; and also for the opposite opinions of observers as to its medicinal and dietetic use ? Is there not a wide-spread error on this subject, especially among European writers, from overlooking the facts and principles just stated ? Does it really increase gastric secretion and digestion in persons not accustomed to its use ? But where it really increases gastric secretion and is not in sufficient quantity, or of sufficient concentration, to materially interfere by its presence with the action of the gastric juice, which it has caused to be secreted in freer quantity, and where by these means it temporarily aids digestion, does it permanently increase the power of the stomach, and are its effects on the liver, the brain, and the general system, such as to demand or justify its use, at least for any considerable length of time ? This question, I believe, with the rarest possible exceptions, should be answered most decidedly in the negative. The effect of alcohol in any quantity, in any form of dilution or admixture, and to any extent, is far more likely on the whole to do harm than good in the average cases of atonic dyspepsia. The effect upon the liver, where it is so apt to accumulate, is almost uniformly bad, and its general influence upon ultimate nutrition is unnatural and lowering, diminishing the proper vitality of tissues. In some cases it increases the amount of fat, but this effect is often the result of a lowered nutritive process, and an evidence of an unhealthy state. The danger of establishing an alcoholic habit is not to be ignored, as the ultimate interests as well as the immediate comfort of our patients are constantly to be considered. As to its effects upon the stomach and upon the whole system when taken in excess, there is no question. Says Dr. Ringer, "Hand-book of Therapeutics," pages 339 and 340, 8th English edition: "After a variable time, the prolonged indulgence in alcoholic drinks seriously damages the stomach by producing chronic catarrh. The mucous membrane, coated with tenacious mucus, excites unhealthy fermentation of the food, while the structure of the membrane itself undergoes considerable alteration through great increase of the connective tissue, which by its contraction obstructs and destroys the secreting follicles and their lining cells. The mucous membrane thus becomes thickened, hardened, and uneven; and owing to obliteration of the orifices of the follicles, cysts form in its substance, and these enlarge from the accumulation of cells within them. In consequence of these serious changes, little gastric juice is poured out in response to the demand made by the food, while the unhealthy mucous coating of the stomach, by exciting morbid fermentations, induces the production of much gas, with various acids, as butyric, acetic, etc., whence acidity and heart-burn. Morning vomiting of a scanty, sour, bitter, and tenacious fluid is a characteristic symptom of this condition."

Who is to decide as to what is excess? How can we tell when the treatment has gone far enough? Certainly the sensations of the patient will not decide this question, as, after the effects described by Dr. Ringer have occurred, the accustomed dram relieves the symptoms.

Dr. Lionel S. Beale, in his work on *Slight Ailments*, says: "People who seldom during a long life have felt really well, often find out for themselves, or they are told by too officious friends, that a little alcohol just before a meal will afford relief. Brandy, gin, bitters of various forms, pick-me-ups, etc., are taken for this purpose, and a worse system has never been carried out. That bad habit of taking now and then ginger-brandy, cherry-brandy, or the worse one of imbibing strong sherry for relieving nausea, a sensation of hollowness or faintness, or fullness, or all-overishness, or what not, has been the ruin of thousands. Once in the habit of adopting this vicious practice, many find it a far more difficult matter to give it up than one would suppose." * * * *

"If a man cannot eat his dinner without swallowing a stimulant, he had better go without it." * * * *

"Many admit that they began because they suffered from a sinking sensation, or nausea, or uneasiness about the stomach which troubled them from time to time, and could invariably be relieved by a little brandy."

"The little brandy gradually increased, and nausea and other unpleasant sensations, instead of occurring once or twice in the day, occurred a great many times, and the victim will tell you he is obliged to resort to the remedy in order to do his work. Of those who act thus, many become slaves to alcohol, and then a more deplorable phase is reached. They are no longer able to abstain, all self-command is lost, and they fail to be able to control themselves in any way, while they will not submit to be influenced by others." (pp. 43–44.)

This is a professional opinion, the result of much physiological study and of practical observation and experience, and it is correct. Dr. Beale, however, immediately proceeds beyond his professional tether, and speaks disparagingly of those who, from this state of indulgence, overwhelmed with remorse, abstain entirely, and hate alcohol more than they loved it before, "who give up the rôle of sinner and adopt that of saint," and from being unable to govern themselves, become determined to govern others, and express indignation against all who take or sell or produce alcohol, and think it hard that they are not able to punish every one who prefers wine to water, and who dares even to look at a stimulant. He goes on to show that his professional opinion was not influenced by any sympathy with the moral movement of the advocacy of total abstinence, by saying—with as much reason might power be given to convalescent lunatics to put all the sane people in strait waistcoats, or confine them in padded rooms, as to give these reformed men the power of restraining temperate people from indulging in the use of alcohol as they may think best.

The moment he leaves his strictly professional grounds, he seems to forget that this moderate indulgence is the cause of the immoderation which he has just been so graphically depicting, and which he so much deplores. The position seems to be something like this: The use of alcohol is useless, is deceptive, is injurious and often deplorable, and extremely dangerous; but it is fanaticism to oppose it even by argument and persuasion, and absurdity and insanity to attempt to restrain its production and use!

But this is following Dr. Beale beyond the limits of professional discussion. With his professional opinion as quoted, I fully agree; with his non-professional sentiments on this subject, if I properly understand them, I have no sympathy.

In view of all these facts and considerations I cannot advise the administration of alcohol in dyspepsia as a common practice, but, on the contrary, must condemn not only its indiscriminate, but its ordinary use. This, I cannot doubt, the ultimate judgment of the profession will sustain. Indeed, the opinion is fast gaining ground among the most enlightened and unprejudiced members of the profession that the medicinal powers of alcohol have been greatly overrated, and that in dyspepsia the use of the article, in any of its forms, should be exceedingly limited.

There is coming to be still greater unanimity as to its unnatural and positively injurious effects, however moderately used, in the physiological state; and as with other medicinal substances which have toxic properties and injurious effects in health, its use in pathological conditions can only be justified by its *known* remedial action in fulfilling useful therapeutical indications. The presumption is certainly always against the habitual or even the accustomed use of any agent having *toxic* properties, such as alcohol unquestionably possesses. That presumption can only be removed, in particular morbid conditions, by the presence of rational indications which experience has proved the article capable of fulfilling. The question presented in each case of disease is, whether upon physiological and therapeutical principles, and judged by the results of enlightened experience, this presumption is removed. That it may be in exceptional instances of atonic dyspepsia, I do not deny; but that such cases are very rare, is my most positive conviction. Certainly the long continued use of alcohol in any case of dyspepsia is attended by injuries and dangers which, in a strictly medical point of view, should, in my judgment, forbid such use.

Among the most frequent conditions for which the dyspeptic seeks relief is the great *acidity of the stomach* and its consequent uneasiness, cardialgia, etc. This, it must be remembered, may be dependent upon either of the two causes already described: a profuse and untimely secretion of an acid gastric fluid, or the fermentation of food. This latter condition, it may be stated in recapitulation, occurs from a deficiency of proper gastric secretion and the presence of ferments which readily excite such chemical action. The results of these actions—the lactic, acetic, oxalic, carbonic, and butyric acids, the sulphide of hydrogen, and various other changing organic compounds, liquid and gaseous—by their presence in the stomach and intestines, and their absorption into the blood, give rise to a great portion of the symptoms of dyspepsia.

The hypersecretion, most frequently dependent upon reflex irritation, calls for a careful inquiry into the original sources of irritation and for efforts at their removal, while palliative measures for diminishing the secretion and neutralizing its excessive action are also required.

The deficient gastric secretion, and its consequences of fermentation and its results, call for measures to increase the secretion or to supply its deficiency, and thus to prevent the fermentation changes. For this latter purpose the mineral acids are among the measures to which we should resort, not on the fanciful principle of "like curing like," but on the simpler and true principle of supplying a needed ingredient for digesting the food, and producing a tonic effect upon the stomach and the general system. These acids act in part on the same principle as pepsin and pancreatin, and in part as excitants and tonics increasing stomach action, and thus preventing the more passive chemical changes. They are more curative than pepsin and pancreatin in the principle of their action, as, in addition to their effects in directly aiding the digestion of food chemically, they tend to improve the condition of the stomach and that of the general system.

Thus they have a double action, while pepsin simply operates upon the food, and most other tonics exclusively on the organism.

It is, however, claimed for the extract of *malt* that the diastase acts upon the food, promoting digestive changes, while the hop modifies favorably organic processes.

There are various particular symptoms occurring in dyspeptic states which have received particular designations, such as pyrosis, water-brash, and urticaria.

Pyrosis, or heart-burn, may arise from a variety of particular conditions. It occurs in cancer and ulcer of the stomach, from excessive secretion arising from reflex action, and in some cases is not to be distinguished from the burning irritation in the stomach caused by the acids of fermentation.

Water-brash is sometimes used synonymously with pyrosis. It consists of paroxysms, at longer or shorter intervals, of a free watery secretion, sometimes chiefly from the salivary glands and the throat, when it is alkaline ; and at other times from the stomach, when it is acid.

It is of frequent occurrence, or was formerly so, in Scotland, Sweden, and other northern European countries, among people who lived upon coarse and insufficient food ; but it is occasionally met with elsewhere, and among all classes of persons. This profuse secretion often pours from the mouth (when from the stomach by an act of regurgitation rather than vomiting) in great quantities, and is accompanied with gastric pain, headache, giddiness, and much prostration.

The paroxysms last from a few to several hours, and are sometimes confounded with what are called "sick headaches."

The paroxysms generally exhaust themselves in a few hours, and may need but little treatment, and the means of their prevention do not materially differ from those recommended in dyspepsia presenting other phenomena.

An improved and regulated diet, eliminatives and laxatives, often the saline (the Carlsbad salt, or sulp. magnesia, ʒj, three times a day, etc.); and tonics, nux vomica, quinine, and the mineral acids; bismuth alone, or bismuth and tannin, etc., are the remedies from which selections are to be made.

When the paroxysms are accompanied with great suffering, morphine, the bromide of sodium, and other anodyne measures may be required.

Urticaria occasionally occurs from wrong digestion, and from the taking of particular articles of food, as fish, cheese, or honey. In such cases evacuants are demanded—emetics sometimes, but oftener cathartics—and the avoidance of the causes will of course be required. When the stomach and bowels are cleared of their irritating contents, the cutaneous irritation and inflammation usually soon subside.

Some cases of urticaria depend upon more permanent causes, and may require other measures; but those depending upon disagreement of particular ingesta require only evacuants, and the subsequent avoidance of the cause.

Gastric neuralgia accompanies some cases of dyspepsia. Pain then is often present when the stomach is empty. Narcotics give temporary relief, and the severity of the suffering will often require their use.

A belladonna plaster over the stomach will often produce a marked effect, keeping the pain in abeyance for considerable periods; but a steady pursuit of the remedies for the dyspeptic state, and for the general neuralgic condition, is chiefly to be relied upon.

The remedies required will not differ from those demanded in other cases of dyspepsia and neuralgia, which present similar general conditions.

The indigestion of drunkards is spoken of as a distinct variety. It is generally organic, dependent upon ulceration, hyperplasia, contraction, etc., of the stomach. When well established and advanced the cases are very grave and the prognosis unfavorable.

There is usually no hope without complete abstinence from the poison which has produced it, and this not unfrequently comes too late.

The preparations of opium, the oxide of zinc in doses of from two to ten grains, the bromide of sodium, bitter infusions, the extract of malt, etc., may aid hygienic measures.

When *superficial scattered ulcerations* exist, moderate doses of chlorate of potash, and of the terebinthinate preparations may be useful.

While the dyspeptic symptoms of drunkards are functional, or before material organic changes have occurred, abstinence from the alcoholics will often be followed by marked and speedy relief.

The indigestion of the aged from failure of power requires the use of tonics and stimulants. Quinine, strychnine, the aromatic spirits of ammonia, spices, etc., will be of use. Wine in these cases is often prescribed, and sometimes it certainly appears to afford relief. That it should in these cases be advised with great caution has been strongly impressed upon me by the too frequent observance of the fact, that where the general powers are failing, discretion and self-control among them, habits of excess are sometimes speedily formed, and the last days of an exemplary life have thus in some instances been sadly obscured.

Nothing is more melancholy than to see the driveling of intemperance added to the imbecility of old age. It is better to forego some slight and doubtful benefit than to run so great a risk of such unpleasant consequences.

With the aged the principal meal should be early in the day. A heavy supper, with or without alcoholics, has in numerous instances proved fatal.

Sometimes alteratives and eliminatives are required in the dyspepsias of advanced life as in other cases, but these must be used with caution when the vital powers are low. Generally aromatics or other stimulants and tonics should be combined or alternated with eliminative measures when they are required. With dyspeptics, some articles may be digested with difficulty, while others are readily appropriated. Thus meat, fruit, fat, or starchy foods may not be properly digested, and may give distress, while other articles are well borne. These peculiarities may depend upon a deficiency or perverted state of the particular secretions which should digest the articles disagreeing; or upon a morbid state of the portion of the alimentary canal most concerned in the digestion of these articles. Each case, therefore, should be studied by itself and its peculiarities regarded.

The salivary secretion may be deficient or perverted, leading especially to the less perfect digestion of the starchy foods. In such cases iodide of potassium, given in proper doses for two or three weeks, may be very useful. A few doses of some mercurial may first be given to modify that secretion.

Where the albuminoids are not well digested, pepsin and the mineral acids will aid the process.

Where the fats disagree, pancreatin would be indicated.

The effects of pepsin and pancreatin are temporary and palliative, rather than permanently curative; but they may bridge over a present deficiency of digestive power, and give time for the recuperative powers of the system, alone or aided by other remedies, to effect a more permanent change.

The diastase in malt is supposed to act chemically in aiding the digestive process of some foods more than other organic tonics, and that, together with the other ingredients of the malt, often produces a tonic and useful effect in different forms of indigestion.

With some persons fluids are not readily absorbed, but remain long in the stomach, diluting the gastric juice and impeding digestion. In such cases moderate quantities only should be taken with the meals, and the conditions of osmosis should be considered, and those which are deficient should, as far as possible, be remedied.

While a reasonable amount of attention should be given to the particulars of diet on the part of those having weak digestion, and to the selection of articles which correct dietetic principles and a well observed personal experience have shown to be best, yet, on the other hand, too much attention may be given to the effects of food. Those who are constantly directing their attention to their stomachs, and watching sensations during digestion, are apt to develop a morbid sensitiveness of the digestive organs, and if the process of digestion is not positively impaired, it is accomplished with less comfort to the patient, and often becomes distressing. Where there is a tendency to this state of things the attention should be diverted from the digestive organs and processes, and where serious indigestion is not present, but where only morbid sensations are experienced during its process, those sensations should be ignored and the patient assured that they are of little consequence; and he should be advised to take a varied but rational diet, following his appetite and instincts, within proper limits, in preference to any preconceived notions of what is best, or even in preference to the conclusions drawn from his experience, when in this state of mental suspicion, of certain articles or quantities of food. He who devotes himself to watching his sensations and looking for morbid ones will be pretty sure to find them, and in proportion to the eagerness of his pursuit. The management of the mental state is far more important, in many such cases, than the administration of drugs, and yet medicines may be very useful, sometimes as placebos, exciting hope and satisfying the mind, but also on account of the changes in the functions and sensations which they may effect.

In most cases there are some real defects of digestion, but in many, far more perversions of sensations; and in such mixed cases, a course of judicious management will be required. Resort must be had to medicinal treatment when clear indications are presented; proper care must be used as to diet, but it is important to avoid a rigid system of exclusion which may result in partial starvation and a lowering of all the powers of the system, including the power of digestion.

A general mild tonic course is in many cases indicated, and small doses of strychnine, acting as it does on the vaso-motor centres and increasing muscular tonicity, or bismuth and lupulin, moderate doses of quinine, etc., will often be found useful. The extremes of much medication and great restriction of diet, on the one hand, and the discarding of all medicines and an unlimited indulgence in articles and quantities of food which are not digestible or which produce unequivocal derangements, on the other, should alike be avoided.

VOMITING.

Vomiting, often a symptom of indigestion, as it is also of various other pathological conditions, occasionally appears as the only recognizable morbid state, and may therefore sometimes be clinically considered as an individual affection. When it depends upon other diseased conditions, they should receive the most careful attention, and remedies should be directed to their removal.

Vomiting may depend upon disease of the brain, or other organs affecting the stomach by sympathetic or reflex action. It may depend upon inflammation of the stomach, or upon foul secretions, or upon improper articles or quantities of ingesta, or upon irritating materials the result of fermentation. Its occasional occurrence is often useful in relieving the stomach of irritating materials. It sometimes, however, occurs very soon after food is taken, and with great persistency, caused by the stomach's intolerance of almost every kind of ingesta.

This form of vomiting is much more frequent in females than in males, and oftener in girls near the age of puberty than in women after this period. Though the vomiting occurs before the digestive process has had time to be advanced, and so large a part of the food is thrown up unchanged, yet it is remarkable that this may go on for a considerable period without any very material diminution of the strength or weight.

Dependent as this peculiar kind of vomiting is upon morbid conditions of the nervous system, it should be classed among the neuroses, is somewhat analogous to the vomiting of pregnancy, and is commonly associated with a hysterical temperament. It is doubtless sometimes, if not generally, associated with some functional peculiarity of the uterine and ovarian organs. This affection is liable to be mistaken for ulcer or other organic disease of the stomach; but the absence of the characteristic pain and hemorrhage of gastric ulcer will serve to distinguish it from that condition; and by exclusion of other structural diseases, and by the presence of other evidences of the hysterical temperament the diagnosis can be made.

Treatment.—The proper treatment of vomiting will depend upon the cause, and upon the form which it takes. As a symptom of gastric inflammation, ulcer, or other organic affection, the original disease should form the chief indication for treatment.

When dependent on inflammation, morphine, hydrocyanic acid, carbonic acid water, and counter-irritation, etc., will be required. When upon ulcer, the restriction of the diet, or intestinal alimentation and the other remedies already advised for ulcer should be resorted to. So of other primary affections producing vomiting. In many cases bismuth, creosote, oxalate of cerium, spices, etc., may check the symptom.

In the peculiar neuropathic vomiting described, these remedies should be tried, but they will often be found to fail. Trials of different kinds of food, prepared and flavored in different ways to suit the taste, should be made, and if any particular article can be found which will be tolerated, others can usually soon be borne.

Sometimes the administration of a very small quantity of food at very short intervals—once in a few minutes—will succeed. The patient may be allowed to take in moderate quantity any kind of food the appetite or fancy may prefer; and it may be found that articles usually regarded as least easy of digestion will be tolerated, when others generally approved of are rejected. However, milk in small quantities, frequently repeated, is perhaps most likely to be retained, and it may be given either iced or very hot, with or without the addition of a little lime-water. Sometimes skimmed milk or buttermilk will answer better than other forms. Raw or very rarely cooked meat, or hard biscuit, or crackers taken dry, may be tried. Indeed a great variety of articles may, in obstinate cases, be tried in succession.

Sometimes, however, a period of complete rest of the stomach will be most successful, the patient being supported by rectal alimentation. After a time, food should again be given by the stomach, and, as soon as this is tolerated, the rectal method may be discontinued. Galvanization of the sympathetic and pneumogastric nerves, followed by general faradization, has been reported as useful. Hygienic and mental management, as in other nervous and hysterical cases, will be required.

Prognosis.—Although this trouble is often protracted and obstinate, the ultimate prognosis, as in other hysterical cases, is favorable.

When the stomach becomes tolerant of food, remedies to improve digestion and the general health, such as nerve tonics, iron, etc., will often be indicated.

ANOREXIA.

Anorexia, or loss of appetite more or less complete, is a frequent symptom of a great variety of diseases, but particularly of those of the stomach.

But independent of these connections, so far as we can at present discover, it sometimes presents itself as an idiopathic affection, or at least as the chief morbid condition, resembling in this respect the vomiting just considered. This also occurs for the most part in girls or young women, and is often hysterical in its character.

It is not uncommon to an extent sufficient to cause anæmia, debility, and more or less emaciation, and in rare cases it may become so extreme as to become alarming.

It is sometimes accompanied with a desire for indigestible substances, such as slate, chalk, charcoal, etc., and, still more rarely, for even disgusting articles. In many cases it is more serious than those moderate impairments of appetite considered under the title of the minor ailments.

As this loss and these perversions of appetite are allied in pathology to the functional vomitings referred to, they require in many respects similar management. Since they are probably for the most part connected with certain evolutions of the sexual system, attention should be given to the functions of those organs, and remedies should be addressed to them as indications are presented.

The *diagnosis* of functional anorexia is to be made by excluding other affections, and for this purpose a careful examination of all the organs and functions of the body, including an examination of the secretions and the blood, may be required.

The *prognosis*, as in vomiting, is usually favorable, when the diagnosis is properly made.

In the *treatment* of these cases of anorexia, the various toniespecially the bitters, as quinine, strychnine, columbo, the aromatics, and the mineral acids, may, if necessary, be tried in succession. In extreme cases the will of the patient must be appealed to, and persuasion, and even compulsion may be required; and the forced taking of food may be followed by a restoration of the appetite. Injecting food into the stomach, or rectal alimentation, may be held in reserve as *dernier ressorts*. In the meantime remedies should be addressed to the mind, and the general condition of the nervous system. A change of scene and society, open air, the sea-shore, bathing, the bromides, etc., may all be useful in different cases.

Flatulency is a frequent symptom in indigestion, and commonly arises from the decomposition of imperfectly digested food. It is believed also to arise from gases secreted by the stomach and intestines, and of course may be the result of air or gas swallowed.

Some articles of food, as beans, turnips, etc., are more liable to produce flatulence than others.

There are various vegetable stimulants, such as anise-seed, ginger, the mints, etc., which act as carminatives, exciting the stomach to contraction and the expulsion of the gases; and anything which will render the digestion more complete tends to prevent the flatulence dependent upon fermentation of food.

The *treatment* of flatulence will vary according to the cause and the condition existing. Care should be taken to avoid those articles of food which produce the symptoms; the digestion should be improved, air should not be swallowed, and various carminatives may be given for temporary relief.

In the treatment of various forms of indigestion, especially those arising from luxurious and sedentary habits, and from excesses in eating and drinking, a course of saline, laxative mineral waters; or of hydropathic treatment; or the grape and movement cures, are often found very useful.

The breaking up of the injurious habits, removal from the usual temptations, the adoption of a plain, simple, regular mode of living, under advice and rules, together with the free use of eliminatives, saline, or even simple water, will often effect the most beneficial changes; and patients may with propriety be sent to watering-places, and to "cures" which are conducted on rational principles by properly educated, sensible, and honest persons. Where such places are from any cause not available, the measures and methods practiced at them may often be imitated at home with great advantage.

The natural mineral waters can generally be imitated artificially with sufficient exactness. The water of the Carlsbad springs, for example, so frequently and so beneficially resorted to in Europe for various digestive and other affections, can be imitated by adding sulphate and carbonate of soda and chloride of sodium to hot water, and a free quantity of the proper dilution can be taken quite warm each morning, an hour or more before breakfast, as is the practice at the springs, and with similar effects. If a little extract of ginger be added, the effect is often better in cases of weakness and depression of the stomach. Proper exercise, baths, and a regulated diet can be prescribed and insisted upon at the patient's home, and thus many of the benefits of distant and expensive watering-places and "cures" can be obtained by the masses of patients. All that is not quackery and deception at these places may be properly imitated by every physician according to his judgment and as he finds useful by experience.

Finally, it may be repeated, that in the treatment of indigestion the causes and the special forms of the disease must be carefully observed, the causes being avoided, and the different forms treated according to the indications presented.

Errors of diet, whether of excess, of deficiency, or of improper articles, must be corrected. Inaction or excess of action of body or mind must alike be avoided or corrected. Diseases of other organs, as of the liver, the lungs, the kidneys, the uterus or ovaries, etc., must receive attention. Compression of the stomach by tight dressing, the abuse of purgatives, and the indulgence in every form of narcotic should be inquired into, their bearing upon the case considered, and everything believed to be injurious prohibited. Without these restrictive measures a cure is always doubtful, and often hopeless. With their proper enforcement and the use of proper therapeutic measures, a cure can very generally be effected.

The medicines to be studied in reference to their effects upon dyspeptic affections are: laxatives and eliminatives, mercury, iodide of potassium, wahoo, witch-hazel, ipecacuanha, alkalies, acids, tonics—quinine, strychnine, salicin, lupulin, and the bitters generally—malt, bismuth, preparations of silver, pepsin, pancreatin, cod-liver oil, mineral waters and their substitutes; creosote, carbolic acid, salicylic acid, sulphites, and laxative enemas.

PARTICULAR PRESCRIPTIONS.

℞	Bismuthi Subnitratis	ʒv
	Morphiæ Muriatis..................	gr. ¾–jss

M.—Carc. ft. pulv. No. xx.

One immediately after the two principal meals.

Dys. with irritable bowels.

℞	Pot. Bitartratis..................	ʒiij
	Magnesiæ Calc..................	ʒj–ij
	Jalapæ Pulv.....................grs.	xv–xxx

M.—At once.

℞	Magnesiæ Calc.,	
	Liquor Calcis,	
	Aquæ Destillatæ......................	āā f℥ij
	Syrupi Aurantii Florum...............	f℥j

M.—Table-spoonful, pro re nata.

Antacid, in dyspeptic colic.

℞	Magnesiæ............................	ʒss
	Spts. Lavandulæ Comp................	fʒss
	Spts. Cari............................	fʒijss
	Syrupi Zingiberis......................	fʒiij
	Aquæ Menthæ Pip....................	fʒij

M.—For two doses for flatulence.

DIGESTIBILITY OF FOODS.

Easy.	*Moderate.*	*Hard.*
Mutton.	Beef.	Pork.
Venison.	Lamb.	Veal. (?)
Chicken.	Rabbit.	Goose.
Turkey.	Duck.	Liver. Heart.
Grouse.	Young Pigeon.	Salt Meat.
Beef-tea.	Wild Water-fowl.	Sausage.
Mutton Broth.	Snipe.	Hashes. (?)
Milk.	Soups.	Mackerel.
Most fresh Fish.	Eggs.	Eels. Herring.
Oysters, soft parts.	Butter.	Halibut.
Stale Bread.	Pike.	Lobsters.
Rice and Starches.	Trout.	Oil. Cheese.
Baked Apples.	Stewed Oysters.	Melted Butter.
Oranges.	Raw Oysters.	New Bread.
Grapes.	Potatoes.	Muffins.
Strawberries.	Beets. Turnips.	*Buttered Toast.*
Peaches.	Cabbage. Spinach.	Pastry. Cakes.
Toast-water.	Apples.	Nuts. Pears. Plums.
	Celery.	Cherries. Pineapples.
	Puddings.	Cucumbers. Onions.
	Common Bread.	Peas. Beans. Pickles.
	Cooked Fruits.	Chocolate.

DIGESTED MILK.

℞	Good Cow's Milk	℥j
	Pure Pepsin	grs. v
	Dilute Hydrochloric Acid	gtts. jv

Digest in water bath at 100° till clear.
Neutralize acid with bicarb. of soda.

But no positive rules as to diet can be given; and, as already stated, there may be injurious results from following too strictly specific rules, or relying too positively upon past experience.

There is a saying that "one man's meat is another's poison," which is an exaggerated statement of the fact that the same rules of diet will not apply equally to all; but this does not prevent the propriety of giving certain general directions which it will be well, or indeed important, for the average individual to follow.

As a rule, meals should be taken three times a day; should consist of some variety; should contain both proteinaceous and carbonaceous elements; one meal should be digested before the next is taken; there should be comparative rest during the more active stage of digestion of a full meal, but without sleep, though sometimes a very short nap is beneficial; and the principal meal of the day should be taken some hours before bed-time.

As to quantity, no positive rule can be given. While there may be a quantity taken to satisfaction, satiety should generally be avoided; but the appetite is not an infallible guide, and the quantity should be influenced by the amount of expenditure in work.

There is certainly in the physiological condition no necessity for alcoholics, or other narcotic or semi-narcotic substances, but warm drinks during meals are by some persons better borne than cold. Abstaining from drinks during meals is by no means necessary, except in cases where fluids are not readily absorbed. An excess of fluids at meal-time may dilute the gastric juice too much, and thus interfere with digestion; but ordinary quantities of fluid, in ordinary conditions, are readily absorbed and do not retard the digestive processes.

The liability to impairment of digestion and nutrition in nearly all forms of disease, places the care of the stomach among the subjects of the greatest and most constant importance in the practice of all departments of the profession. Too much attention can scarcely be given to its study.

GASTRALGIA AND GASTROËNTERALGIA.

These terms are used to indicate paroxysmal pain in the gastric and intestinal regions, at the places of distribution of the vagus and sympathetic nerves, but independent of the immediate effect of irritating ingesta, and of appreciable lesions of the coats of the stomach and intestines. This stands in a sense between diseases of the stomach and the intestines and those of the nervous system; and, though inclining to the latter, may be briefly considered in this connection.

Causes.—These neuropathic pains are most frequently produced by the causes of neuralgia in general; and they probably, though the fact has not as yet been demonstrated, depend essentially upon some material changes in the vagus and sympathetic nerves.

The repeated irritations and pains caused by some alimentary substances, such as lobsters, etc.; and by other ingesta, such as free quantities of spices, of coffee and tea, and alcoholic liquors, or various medicines too long continued—drastics, copaiba, etc.—are different from the form of paroxysmal pains now under consideration.

Pressure upon the course of the nerves by morbid alterations, tumors, varices, etc., may be a cause of this pain, it being expressed in the terminal branches. It may also be caused by disease of the central nervous system; by myelitis, cerebral or spinal sclerosis; by lesions of the liver, pancreas, spleen, or kidneys; or of the utero-ovarian apparatus, the pain being produced by reflex action.

Constitutional causes, such as chlorosis and anæmia, tuberculosis, prolonged lactation, sexual excesses, and involuntary seminal losses, sometimes produce the disease. It may occur as an expression of the gouty diathesis or of a general neurosis—hysterical or hypochondriacal—or of still other conditions.

It is sometimes independent of all recognizable causes, and has been said to be due to a spontaneous hyperæsthesia of the nerves concerned, which explains nothing; and it has also been attributed to an alteration of the gastric secretion, which is only a conjecture not confirmed by proof.

The disease may occur at any age, but is more frequent in women, and is thought to be favored by the artificial life or unfavorable hygienic conditions of large cities.

Gastralgia may be acute, subacute, or chronic; it is always paroxysmal, but the period of recurrence varies greatly, and the duration of each paroxysm varies from a few minutes to some hours in the less acute cases. When it occurs at regular periods, as daily or every second day, it indicates, or at least suggests, a malarial cause.

In the more acute cases the pain is sometimes very severe and overwhelming. It may come on suddenly without any premonition, or it may be preceded by increased salivary secretion, eructations, pyrosis, and nausea, and sometimes by vomiting ; it is more likely to occur when the stomach is empty than when it contains food.

The pain may be gnawing, burning, contusive, contractive, or tearing, and is often agonizing. It is most severe in the epigastrium, but often extends to the back, and sometimes over the whole abdomen. It is generally somewhat relieved by firm pressure made over a large surface, as by the palm of the hand, though increased by light pressure, and also by strong pressure upon small points, as by the ends of the fingers. The epigastrium, though raised when there is much gas in the stomach, is often retracted.

When the pain is severe the features are usually pale and contracted, the extremities are cold, and sometimes bathed with a clammy sweat, faintness and even complete syncope sometimes, but rarely, occur, and reflex actions often take place, and in rare cases amount to general convulsions.

Sometimes associated sensations are diffused to the various parts under the influence of the solar plexus, to the hypochondriac region, to the kidneys, spermatic cord, etc., while at other times and in the lighter forms there apparently is hyperæsthesia of the vagus only, this justifying the distinction of two varieties, the one involving the vagus chiefly or only, the other the solar plexus. From irritation of the vagus we have constriction of the œsophagus, a sense of burning in its course, sometimes great thirst, and various perversions of taste.

Vertigo accompanied by different morbid sensations, often of emptiness in the head, a sense of falling, and momentary obscuration of sight, and sometimes staggering and even falling occur.

These symptoms may excite suspicion of disease of the brain, but they are dependent upon the conditions of the stomach, are generally coincident with the neuralgic paroxysms, but may exist alone, or in connection with other stomach symptoms.

At the termination of an attack there are often yawnings, a light sweat, and free secretion of urine.

The digestion may be unimpaired, and the pain not at all produced by any articles of food taken. Indeed in some cases taking food is among the most effectual methods of relieving the pain. But pain of this paroxysmal and neuralgic character may be associated with flatulent dyspepsia, with acidity, or with the production of fetid gases from deficiency of gastric juice, and the decomposition of nitrogenous substances. In these dyspeptic complications there will usually be a foul tongue, unpleasant taste in the mouth, deranged bow

Diagnosis.—It is to be distinguished particularly from peritonitis, ulcer and cancer of the stomach—from peritonitis by the absence of fever and the decided tenderness on pressure; from ulcer and cancer by the history of the case and the more frequent occurrence of the pain during fasting, or at least by its not being in the same manner produced by taking food, by the absence of hemorrhage and other symptoms indicating these conditions, and by the presence often of a general neuropathic state. From other conditions, such as gastritis, biliary calculi, diseases of the transverse colon, of the duodenum, or of the pancreas, or an aneurism of the abdominal aorta, etc., accompanied by pain in similar regions, gastralgia may be distinguished by a careful and intelligent comparison of all the symptoms and conditions.

The accidental pains in the stomach produced by irritating ingesta, foul secretions, or the results of the decomposition of food, will be distinguished from the disease under consideration by the history and the accompanying circumstances of each case.

Prognosis.—The *course* of these cases of gastralgia inclines to be chronic, but the duration depends upon the cause, as does also the prognosis as to a cure. The disease is seldom fatal; and if much feebleness and emaciation occur early, some other morbid condition is usually present. Though the prognosis is usually favorable, gastralgia may be but a symptom of grave lesions of the central nervous system which will have an unfavorable termination.

Treatment.—In the case of simple gastralgia, independent of the presence of irritating materials in the stomach, opiates in proper (rather free) doses, or repeated at short intervals, will almost always bring the paroxysm to an abrupt and complete close. This will tend to establish the diagnosis. Morphine hypodermically is perhaps the quickest method of procuring relief, though when placed in a dry state far back upon the tongue, or introduced into the stomach when nearly empty, its effects are very prompt. The dose may be from one fourth to one half a grain to an adult, or even more where it has often before been given and its effects observed; and if not effectual it may be repeated in suitable quantity in half an hour. Susceptibility to opiates varies very much in different cases, and is influenced by the severity of the pain and by their previous use. Proper caution should be exercised, but free quantities are usually borne, and required, when the pain is great. Spts. of camphor will sometimes produce decided relief, but it is less certain and efficient than the opiates, as are all other of the narcotic substances in all ordinary cases. It will be well to bear in mind, however, that an idiosyncrasy exists in some very rare cases, where opium and its various preparations not only fail to relieve suffering, but actually produce great distress—as in two or three cases I have known—not very unlike the gastralgia we are considering. Even small doses will affect some very unfavorably, and larger ones still more. These cases are, however, so very rare and exceptional, that such an idiosyncrasy is not to be apprehended, unless previous experience has proved its existence. Where it does exist other anodynes must be substituted for the opiate. The inhalation of chloroform or ether will sometimes procure prompt relief. The hydrocyanic acid, chloral hydrate, and the other anodynes or narcotics, such as hyoscyamus, belladonna, lactucarium, etc., may be tried. A combination of morphine and atropine hypodermically will often answer well where morphine alone would not be well borne. Chlorodyne and various other compounds will be adapted to particular cases. These means may be aided by sinapisms or hot fomentations over the stomach, warmth to the extremities, or the drinking freely of warm diluents, etc.

Whenever a pain in the stomach is accompanied, and may be supposed to be produced by irritating materials within it, evacuants, as by emetics or cathartics, or diluents or antidotes may be indicated ; but even in these cases anodynes may be required for the relief of the suffering before evacuation can be effected, and after its accomplishment for allaying the irritation left behind.

As to preventive measures, or the treatment of chronic cases, reference must be had to the cause. If the cause be anæmia, chlorosis, gout, affections of the pelvic organs, errors of regimen, etc., attention must be given to them, and if removed, their effects will usually soon cease. When dependent upon organic diseases of the nervous system, on tuberculosis or any conditions not removable, the gastralgia, though capable of great palliation, may not be capable of radical cure.

Each of the causes alluded to must be treated according to its nature and indications—anæmia and chlorosis by iron, malaria by quinine, impurities of the system by eliminatives, dyspeptic cases by appropriate remedies for this affection, and so of other conditions.

In many cases bismuth, operating as it does to some extent as a local anæsthetic to the stomach, modifying the hypersensibility of the gastric nerves, not only procures present relief of the pain, but in some cases effects a permanent cure. In order to obtain its full effects, from twenty to thirty grains of the carbonate, or nearly as much of the subnitrate, are required. When continued for a length of time, as it usually should be, somewhat smaller doses repeated three times a day will be the proper quantity.

If the gastralgia is dependent upon improper alimentation, the diet must be changed, the habitual use of tobacco, and often of coffee and tea, must be abandoned, the bowels must be regulated if constipated; and if uterine or ovarian disease be the cause—and in females these organs and their functions should be inquired after, and if necessary carefully examined—treatment should be directed accordingly.

When oxaluria is found to be present, the nitro-hydrochloric acid and other appropriate remedies should be given.

The saline mineral waters of the continent of Europe are frequently resorted to in these cases with benefit, and I have found in several instances an artificial substitute (of moderately laxative saline doses in large dilution taken early in the morning, as already advised in some cases of indigestion) to be followed by very marked relief.

The treatment by electricity of different forms of neuralgia, including this of which we are treating, has of late received much attention, and is doubtless of use in some cases; but its virtues have, by some specialists, been much exaggerated, though its skillful use should be tried in obstinate cases. Some advise that in neuralgia "drugs should not be resorted to until after a thorough trial of electricity," but even if this remedy be early used, indications which can be fulfilled by drugs and other means should not be neglected. The duty of the physician is to relieve and cure his patient by any means within his control, rather than to reserve the case for the trial of the efficacy of any particular remedy whose character is not fully established. There is, however, much testimony in favor of this remedy, and the fact of its efficacy in many cases must be accepted.

When hysteria is present, antispasmodics and the bromide of potassium will palliate the symptoms, while nitrate of silver, arsenic, valerianate of quinine, and other tonics, will often be useful.

In *Stomachic Vertigo* treatment should be chiefly directed to the conditions of the stomach, and may include a variety of remedies depending upon the special conditions presented.

Neuralgic pains similar to those we have been considering have their chief seat in the intestines, and arise from similar causes and require similar treatment. They are to be distinguished from intestinal inflammation, strangulation of the intestines, typhilitis, and perityphilitis, and ulceration and rupture of the vermiform process, from common intestinal colic and nephritic colic, and from lumbo-abdominal neuralgia and myalgia, by the exclusion of these conditions. These affections are elsewhere considered, and a comparison need not here be entered upon.

As palliative measures for gastralgia and enteralgia, the preparations of opium, in a vast majority of cases, are far more efficient than any other remedy, but much care should be exercised in prescribing them, and they should be kept as much as possible in the hands of the physician, lest a habit of opium taking be established.

The pains from lead poisoning are allied to those of neuralgia, and lead colic is by some authors treated of in connection with enteralgia, but it will be considered elsewhere.

DISEASES OF THE INTESTINES.

The intestines resemble the stomach in structure and function, and yet they differ from it in both these respects. They have the same number of coats, but the mucous membrane of the stomach is somewhat different in its structure, has a different set of glands within it, the size of this portion of the canal is greater, and its muscular action is quite unlike the uniform, vermicular, contracting motion of the intestines. While the food is moved about in different directions, and while the stomach sometimes contracts down in the centre so as to form a more or less complete partition in its cavity, the intestines very seldom have their vermicular motion reversed, and their contents have normally but one direction in their movement.

The stomach, for the most part, secretes acid and the peptic fluid, and the secretions normally within it—with the exception of the salivary, buccal, pharyngeal, and œsophageal fluids swallowed—are its own. The intestinal secretion is alkaline, and these organs receive the alkaline secretion of those large glands—the liver and pancreas.

The digestive functions of the intestines differ from those of the stomach. Their alkaline contents emulsify the fats, and they complete various processes commenced in the stomach. They have a special set of vessels, the lacteals, with mouths opening upon their internal surface, taking up certain elements of the food and conveying them by a special channel to the blood, and their veins absorb in a similar manner to the veins of the stomach ; and the materials taken up by both are conveyed through the portal vessels to the liver, and are acted upon by that organ.

Different portions of the intestinal canal have different structures, and somewhat different functions. The duodenum resembles the stomach most, but it differs in its villi, in its having the beginning of the valvulæ conniventes ; in its having the glands of Brunner ; in its alkaline secretion, and in receiving the common duct and the secretions from the liver and pancreas. From its peculiar relations to the pyloric end of the stomach, to the left lobe of the liver, and to the transverse colon, it is difficult to distinguish its pains and tenderness from those of these other organs.

Its *diseases* resemble those of the stomach more than do those of the other intestines. It is subject to ulcers closely resembling those of the stomach. Simple penetrating ulcers are sometimes found in it, with symptoms rather more mild, but with results much the same as gastric ulcers. To this fact I have already referred.

Its diseases, however, for the most part, are shared with the other small intestines; but the ductus communis opening into it establishes peculiar relations between it and the liver and pancreas. When the duodenum is congested, irritated, or inflamed, by spasm or swelling, that duct may be obstructed, and the free passage of bile and pancreatic fluid may be prevented.

Irritation of the excretory duct of a gland modifies, generally increases, its secretion. The liver and pancreas are doubtless not exceptions to this law. From an obstructed flow of bile jaundice may be produced, and from a much increased flow bilious diarrhœa or vomiting may result.

Again, a catarrhal inflammation may by continuous sympathy extend from the duodenum to the gall ducts, or from these ducts to the duodenum, and the same is probably true in reference to the pancreas. Other parts of the intestines have their peculiarities.

DISEASES OF THE DUODENUM.

Symptoms.—*Acute catarrhal inflammation* of the duodenum, as of other portions of the small intestines, may occur, and may possibly be confined to that portion of the canal. It is accompanied by dull pain, moderate tenderness in the region; by a febrile movement generally moderate, and often by jaundice. The tongue will be coated, the appetite impaired, and more or less digestive derangement will occur.

Treatment.—The treatment will consist in the use of a light diet, in the administration of alkalies, and sometimes of sedatives, and, in severe cases, in the application of leeches, cup, blisters, etc.

As, however, common acute inflammation of the duodenum is of a similar character, and is generally associated with the same disease in other portions of the small intestines, it need not be further distinguished from that in them.

The duodenum is particularly liable to ulceration in severe burns of the skin. Why and how this is, is not understood; but the fact has been so often observed, that it is believed to be more than a mere coincidence. Hemorrhages may be the result of such ulcerations, or of other diseases of the duodenum, but they are scarcely distinguishable from hemorrhages from other portions of the small intestines, and require no peculiarities of treatment.

The ulcerations from burns, even if the diagnosis could certainly be made, would perhaps require no other treatment than a bland diet and soothing measures.

Inflammation of the duodenum, sometimes of an acute but oftener of a chronic character, may be the result of disease—inflammatory, ulcerative, cancerous, etc.—of the pylorus. It may be confined to the mucous membrane, or extend to deeper tissues. It could not with certainty be clinically distinguished from disease of the pylorus, and, if it could, it should not be treated differently from disease of that part.

There may be mechanical obstruction of the duodenum by cancer, by an enlarged pancreas, by hydatids, etc. There would be pain, depression, vomiting, but not fæcal, probably not of bile, as the obstruction would be likely to be above the opening of the duct; and there would not be distention of the abdomen such as would occur were the obstruction much lower in the intestines. The treatment, as in most other cases of intestinal obstruction, especially of the small intestines high up, could only be palliative, with anodynes, etc.

It may be well to remember that the duodenum may be digested *post mortem* under similar conditions to those of the digestion of the stomach and lower part of the œsophagus.

DISEASES CHIEFLY OF THE SMALL INTESTINES IN GENERAL.

INFLAMMATION OF THE SMALL INTESTINES OFTEN EXTENDING TO THE LARGE.—ENTERITIS.—ENTERO-COLITIS.

These terms define the diseases to be considered. There are three varieties of inflammation of these organs, viz., catarrhal, follicular, and phlegmonous.

Catarrhal Inflammation is the most common, and is often called muco-enteritis. This is a diffused inflammation of the mucous membrane of these intestines, but is seldom uniform in severity in the different parts, and rarely affects the whole surface of the small portion of the canal. It is generally most expressed in the ileum, but not uniformly so. Often it extends from the ileum to the colon, and then takes the name of ileo-colitis.

Follicular Enteritis is where the inflammation is chiefly present in the intestinal follicles, and not so uniformly diffused over the mucous membrane. It is by no means always clinically distinguishable from simple catarrhal enteritis, and its distinctive character is chiefly interesting in a pathological point of view. It may practically be considered with the former.

Phlegmonous Enteritis is an inflammation involving all the coats of the intestine—mucous, muscular, and peritoneal. It is usually confined to a more limited extent of intestine, is clinically distinguishable, is pathologically and therapeutically, and therefore practically, quite different from either of the other varieties, and will require to be treated of separately.

MUCO-ENTERITIS.—INTESTINAL CATARRH.

Of this disease Jaccoud makes the following

- Varieties:
  - Acute,
    - 1. Mild or Common.
    - 2. The Choleroid.
    - 3. The Typhoid.
  - Chronic,
    - Diarrhœal form.
    - Dysenteric form.

Of the *Acute*, the Choleroid and Typhoid might be called serious or grave, while the Common form is more benign.

Pathologically, muco-enteritis is analogous to gastric catarrh. There is in both hyperæmia of the mucous membrane; at first it may be comparatively dry, but soon there is a hypersecretion, and often a more free transudation of fluid. The increased secretion is chiefly mucus, but variable in consistence, according to the exudates mingled with it. There is more or less serum, not unfrequently blood, and sometimes fibrinous material exuded from the vessels.

Morbid Anatomy.—Anatomically, in this disease, there are deep venous redness, inflammatory thickening, enlargement of follicles, and impaired cohesion. In more protracted cases the mucous membrane is sometimes condensed and hardened, congested, and studded with black pigmentary deposits. "There is often atrophy of the Lieberkühnian follicles, with granular or fatty degeneration of their epithelial contents, and atrophy, or sometimes enlargement, of the solitary and agminated glands."

Occasionally, in the more chronic cases, the exudate upon the surface forms a membranous pellicle in patches consisting of corpuscular elements held together by a coagulable exudation, and retained by prolongations into the follicles. In these conditions the disease is of a more severe character than in simple catarrh, the membrane is more thickened, and there is sometimes decided hemorrhage, suppuration, or necrosis ensuing. In the milder cases of short duration the submucous tissue is not changed, while in the more severe and protracted cases it is congested and infiltrated. In the chronic variety the redness is less marked, the membrane is darker, the slaty-colored follicles project, and in some cases there are polypoid growths upon the membrane.

The muscular coat, often relaxed, may sometimes be hypertrophied and contracted, giving rise to stricture. This, however, is infrequent.

In infants especially the secretion may be abundant, giving rise to profuse diarrhœa; and post mortem the intestines may be full of a liquid transudate.

Either the acute or the chronic form may result in ulceration, sometimes commencing in small suppurative points on the mucous surface, multiplying and spreading, possibly ending in perforation; at other times the ulceration begins in the isolated follicles, constituting cases of ulcerative *follicular enteritis*. These ulcers are round, of the size of a pea or a little larger, the borders are injected, and the bases are uneven. Some of these remain isolated, while others coalesce, forming more extensive lesions. These small ulcers may penetrate the intestine, though commonly they remain more superficial, and in favorable cases heal by cicatrization. They are more commonly located near the ileo-cæcal valve, and may be so extensive as to destroy it; or by contractions of the cicatrices they may cause strictures which will obstruct the fæcal passages. Such ulcerations not unfrequently occur in tuberculosis.

Where the disease is acute and terminates early, the post-mortem appearances are much less marked. The hyperæmia, which was doubtless intense during life, may to a great extent disappear after death; and before ulceration, thickening, or much softening has had time to take place, no striking morbid appearances will present themselves. A careful examination will, however, show changes in the epithelium and the follicles, fæcal matters will often adhere to more diseased parts, and hyperæmia or ecchymosis will usually in some points be discovered. Commonly, however, the hyperæmia is readily distinguishable.

Etiology.—Simple acute catarrhal enteritis, or colo-enteritis, is much more common in children than in adults, but it may occur at any age. It is much more frequent in the heat of summer than at other seasons, and is commonly called the "summer complaint." It prevails to a much greater extent in cities than in the country, and is among the chief causes of the great infant mortality in our American cities.

The particular *causes* of catarrhal enteritis are numerous.

The inflammatory fluxions may be produced by local irritants applied to the membrane, by disorders of innervation affecting the vaso-motor system, by the suppression of other fluxions or discharges, by stasis from obstructed venous circulation, by atmospheric influences, or it may occur as a symptom of some other disease. It may also be caused by peculiar poisons—sewer gases, the results of organic decompositions, etc.

The mucous membrane of the intestines may be irritated and the disease produced by too much food, or food of an improper quality, by the passage into the intestines of food imperfectly elaborated by the stomach, or by irritating secretions. Young children at the breast, and especially at the time of weaning, are often seriously affected by the bad quality of the milk of the nurse, or by articles of food not adapted to the condition and power of the stomach, by too much fat, spices, unripe fruits, etc. But the best of nurses' milk may disagree from a want of proper digestive capacity in the child.

Retained fæcal matter on the one hand, and the too free use of purgatives on the other, may also readily excite inflammation in a susceptible condition. Neutral salts are less irritating than most other cathartics. They operate to a large extent mechanically, by increasing the density of the intestinal fluid, and causing a serous exudation by exosmosis; and yet when freely used, a more specific irritating effect is produced, and inflammation may follow. The influence of bile in producing irritation and exciting diarrhœa, has perhaps been exaggerated; still, when abundant, and especially when vitiated, it may cause catarrhal enteritis.

Burns of the skin, impressions of cold and moisture upon the feet and other parts of the body, and mental emotions, operate through the nervous system, changing the circulation through the vaso-motor filaments. Compensatory determinations of blood to the intestinal vessels may be caused by suppression of the discharge in hemorrhoids, the receding of articular gout, and the suppression of the menstrual flow.

Catarrh of the intestines by stasis may be caused by obstructive disease in the liver, the heart, or the lungs, and by a varicose condition of the abdominal veins.

Intestinal catarrh from atmospherical influences may be produced by a sudden suppression of cutaneous circulation and transpiration, thus throwing more blood and additional work upon the mucous surface; and besides, the atmosphere, especially in cities and in the heat of summer, is often loaded with poisonous effluvia. The heat also lessens respiration, diminishes the oxidation and combustion of carbonaceous matters in the system, throws more eliminative work on the liver and intestines, causes portal congestion, and thus tends to the production of muco-enteritis.

In tuberculosis, in pyæmia and septicæmia, in typhoid and eruptive fevers, in Bright's disease of the kidneys, in catarrh and other diseases of the stomach, and finally in the irritation of teething, symptomatic intestinal catarrh is liable to occur.

SYMPTOMS AND COURSE OF MUCO-ENTERITIS.

The symptoms in intestinal catarrh vary much in severity and in their progress, and not a little in their character in other respects.

The *milder variety*, as occurring in adults or older children, especially when caused by local irritants to the membrane, is apt to come on suddenly, and generally not long after a full meal, or after taking irritating articles of food. If from any cause the food is not properly digested in the stomach, passing in a crude state into the intestines, these attacks are liable to occur. They commence with pains of moderate severity, most severe about the umbilicus, but moving in different directions about the abdomen. The patient, from the increased sensibility of the intestines, is conscious of their peristaltic movements. These colicky pains are usually accompanied by more or less flatulence, and are paroxysmal. They are not unfrequently accompanied by a sense of nausea. After a few attacks of pain, evacuations take place—at first fæcal—and in very light cases relief follows, and they assume no other character. The irritating materials are removed and the patient is soon restored to his usual condition.

In more severe cases the pain and evacuations persist, the discharges become semi-fluid or liquid—often sero-mucous, they may be colored very yellow or more or less green with bile—but consist mostly of serous transudate and a secretion from the intestinal glands, containing also a free quantity of epithelium of young cells—often vibriones and fungi—and a considerable amount of chloride of sodium and triple phosphates, the reaction being usually alkaline. Their frequency varies, but usually there are from three to ten in the twenty-fours hours, after which the symptoms subside. In some cases, with all the other symptoms present the evacuations are few and slight, or they may not occur at all, though this is unusual. If not severe, the pain and other symptoms may subside in from a few hours to a few days, but the relief is not apt to be as complete as where free evacuations occur.

In more intense cases the intestinal symptoms are often preceded for a day or two, or more, by a general feeling of indisposition, by a foul tongue, painful digestion, borborygmus and distended abdomen. Soon stools occur of the character before mentioned, but with more frequency, and often their frequency is increased by even moderate quantities of food or drink.

The patient feels weak and inclined to rest, but the appetite may not be greatly impaired, and only a moderate fever makes its appearance, and is remitting. The exacerbations occur in the evening, and usually are not marked until the second or third day. In the benign forms the stools preserve their sero-mucous character, are liquid, and generally colored with bile. When the duodenum is much involved jaundice is likely to appear in a few days, and the stools may then become pale or ash-colored.

When the upper portion of the intestines is the seat of the catarrh the stomach is likely to be involved, and there is less diarrhœa, the digestive troubles being most marked. The ileum and colon are commonly the principal seat of the inflammation in the more typical cases.

When the colon is the chief seat of this kind of inflammation, the stools are more frequent, more mucous, sometimes bloody, but less abundant, the disease thus merging into simple non-specific dysentery.

In children the symptoms are essentially similar to those already detailed. The fever, however, is more decided; is remitting, with two or three exacerbations in the twenty-four hours; the stools are apt to be more frequent, the disease is likely to be more protracted, and the results with delicate children more serious. The proportion of cases with them is greater in summer, as compared with other seasons, than with adults, and they are much more subject to the occurrence of the disease. The more severe types in children take the form of *cholera infantum.* This term, as used in this country, embraces those "summer complaints" of children generally under two years of age, marked by free and often frequent purging and vomiting, by great depression, and often by collapse and death. The evacuations early become watery, the disease runs a rapid course, is accompanied with great thirst, with feeble circulation, generally with coldness and blueness of the extremities, with sunken eyes and pinched and depressed countenance, and sometimes with cramps; and it so nearly in the worst cases resembles epidemic cholera, that, were the latter prevailing, the diagnosis would be difficult, or in some cases nearly impossible. In cases continuing any considerable length of time, entero-colitis becomes manifest.

A serious form of *choleroid catarrh* occasionally attacks adults. This, too, chiefly occurs in warm weather. The onset is sudden, marked by cramping pains in the abdomen, soon followed by copious purging and vomiting; the discharges, at first of whatever may be in the stomach and intestines at the time of the attack, soon become watery and often colorless, as, whether the biliary secretions be suppressed or not, the serous exudation is so abundant as to give its character to the evacuations. In consequence of this great loss of the fluid portions of the blood, supposed to be due to the paralysis of the intestinal vessels, there is extreme thirst, diminution of water in the urine, condensation of the blood, and slowness and feebleness of the circulation, lowering of the temperature, blueness of the face, cramps in the muscles, particularly of the extremities and abdomen, and a husky, peculiar voice.

In this description symptoms almost identical with those of Asiatic cholera will be recognized. The disease has been termed English cholera, sporadic cholera, and cholera morbus. It occasionally accompanies malarial fevers in the region of their prevalence, certainly in the new regions of the West, where formerly I have frequently encountered it, merging the paroxysms of chill, fever, and sweating into itself.

In all these cases there is a decided fluxion to the intestinal canal, and, when it continues a sufficient length of time, all the essential phenomena of inflammation are presented.

Diagnosis.—This disease is to be distinguished from Asiatic cholera not so much from the difference in the vomiting and purging, as from there being less of the asphyxiated condition, and from the great difference in the result.

Cholera morbus is seldom fatal except in children and in debilitated adults or aged persons. It is usually promptly amenable to treatment, and even when left to itself, will often subside in a day or two; at least the evacuations will materially diminish, and sleep and general relief from the more active symptoms will follow, and in time recovery takes place. Sero-mucous discharges, tenderness, pain, feverishness, and other symptoms of muco-enteritis not unfrequently supervene.

When death results from the more active early symptoms, the transudations may continue when from paralysis of the gastro-intestinal muscles the discharges cease. The blood thickens, the circulation fails, and death occurs from collapse.

Typhoid Enteritis, another variety of intestinal catarrh, grave in character, occurring mostly in children during nursing or at the time of weaning, during dentition, and in the summer season, resembling in its pathology cholera infantum, but coming on more slowly, and not accompanied with the same severe vomiting and copious purging, nor having its rapid course and tendency to collapse, is called by Jaccoud a typhoid form. In this form of the disease, frequent in this country, particularly in cities, the stomach is also affected, and the gastric symptoms are generally first in appearance.

The child is sad and uneasy, with loss of appetite, though, from its thirst, often nursing or drinking milk freely, but vomiting it unchanged or simply curdled. Diarrhœa soon comes on, with acid liquid stools of a yellowish, yellowish green, or more deeply green color, while floating in the fluid are flakes of casein; or the stools are sero-mucous, with occasionally streaks of blood. Chemically analyzed they are found to contain bile pigment, fatty acids, and some chloride of sodium. There is tenderness of the abdomen, meteorism often, and fever of a remitting type; the temperature varies from 102° to 103.5° or more, and in the severer cases, under the combined influence of the want of properly digested food, the fever, the pain, and the exhausting diarrhœa, the child soon becomes prostrated, its countenance assumes a pinched, depressed, and typhoidal expression; it often lies, during the intervals between the discharges, in a somnolent state, with its eyes turned up and partly open; the tongue becomes red at the point and edges, and often dry and darkish, the fever assuming a more or less distinctly typhoidal type, and if continuing long, as is not unfrequently the case, decided emaciation, with a wrinkled, harsh skin, supervenes, and the infant often has the appearance of age. The stools may become more solid, but excessively fetid, varying in color, not unfrequently becoming pale, clayey, or slaty, though they are sometimes simply watery, scarcely staining the diaper.

Vomiting rarely persists after the first two or three days; the thirst is often great, but the child is sometimes averse to taking anything into its mouth.

The disease may terminate in gradual improvement and recovery in from one to three weeks, though many children die within that time, death being preceded by coma with depressed fontanels, caused by cerebral anæmia and exhaustion. Occasionally convulsions occur, which may be terminal. Some cases pass into a more chronic state, with symptoms of diarrhœa, etc., often subsiding and reappearing at irregular periods. This form of disease is regarded by some as distinctive typhoid fever, but many of the cases differ from that specific disease.

Adolescents, and particularly young females, are sometimes attacked with muco-enteritis of the more severe and protracted kind. It occurs sometimes in cases of hysterical dysmenorrhœa with neuralgic complications, presenting extreme tenderness of the abdomen, and other symptoms which to the uninitiated appear very alarming. Severe inflammation extending to the peritoneum and other parts may be feared; but the temperature is not very high, the tongue is not particularly red or dry, the pulse not always rapid, and firm pressure upon the abdomen will be found to be borne better than slight. In some of these cases the disease is chronic and obstinate, the discharges mucous and often scanty, accompanied with tenesmus, and assuming many of the characteristics of chronic dysentery.

In other cases of adults, the disease, at first comparatively mild, becomes chronic and obstinate, resulting in ulceration and other lesions of the intestines, in great depression and emaciation, and sometimes in death.

In our late civil war, from insufficient and improper articles of food, from exposure, malaria, and other anti-hygienic influences, a very severe form of enteric inflammation occurred, often complicated with a scorbutic state, and resulting in great mortality or in protracted impairment of health. Ulcerations of both the large and small intestines were frequent conditions—very general in the severe or protracted cases—requiring often a long course of the most careful management, dietetic, hygienic and medicinal; and then sometimes disastrous or unsatisfactory results would follow.

Other cases of more grave intestinal catarrh, produced by the various causes enumerated under the head of the etiology of the disease, occur in adults, and are more or less severe and obstinate, depending upon the character of the causes and other accompanying pathological conditions. Some are rapid in occurrence and course, others more gradual and protracted, agreeing in general features, but varying in particular symptoms.

Diagnosis.—The diagnosis in the mild cases of intestinal catarrh is not difficult. In the severer cases the resemblance to typhoid fever is often marked; but in children at the breast it is more easily made, as they are seldom subject to typhoid fever; and when this does occur in somewhat older children, the circumstances under which it appears are usually different. Still, some cases even in young children are probably genuine typhoid fever, which have heretofore been regarded as simple muco-enteritis.

In adults the diagnosis of the severer cases is not always easy, as, during the first week particularly of typhoid fever, the characteristic nervous symptoms, the epistaxis, the bronchial catarrh, the splenic enlargement, and the rose eruption, may be absent. The fever, however, is more intense, more regular in its approach and increase, in typhoid fever; the diarrhœal discharges have more the appearance of "pea soup" or new cider, and are not so mucous in character, and the general aspects of the patients and the course of the cases are different. There is commonly more pain and general tenderness of the abdomen in enteritis than in typhoid, and when the abdomen is distended, as it may be in either, the distention is more central in catarrhal inflammation, and the abdomen is "pot-shaped," while in typhoid the colon is more distended, and the abdomen is "tub-shaped."

In the *chronic* form of intestinal catarrh secondary to the acute, the history of the case and the existence of the causes enumerated will aid the diagnosis; and in those cases *chronic* from the beginning, the apyretic approach, the less prostration, the return of more severe symptoms at variable intervals, depending often on taking food, the tenesmus when the rectum is involved, etc., will lead to the distinguishing of the disease. In these more chronic cases slowly approaching, the appetite and digestion may not, for some time, be much disturbed, but soon they will fail, and imperfectly digested aliment reaching the intestines, irritation, diarrhœa, or dysenteric discharges will make their appearance.

Very generally, in muco-enteritis, discharges from the bowels are more frequent and more copious than normal, but this is not always the case. Sometimes even constipation is present, the catarrhal exudations are absent, the movements of the intestines weak and sluggish, and the intestinal contents are tenacious and retained. In these cases the suffering is greater; the retained mucus exciting in the food and secretions decomposing changes, there is constant meteorism, distention of the abdomen, interference more or less with respiration and circulation, and, where this variety is caused by mechanical stasis from obstructive diseases of the liver, heart, or lungs, as is often the case, embarrassment to the respiration and circulation may become very great. The diagnosis in these cases, if a careful investigation is made, ought not to be difficult.

Prognosis.—The course and termination of muco-enteritis, as the foregoing account shows, will vary much in different cases, but generally, especially in adults, the prognosis is favorable; and the same may be said of the ordinary, simple, accidental forms in children.

In complicated cases the prognosis will depend upon the accompanying states—upon their severity and remediable character. In organic heart diseases, in consumption, in cirrhosis of the liver, in Bright's disease of the kidney, etc., the prognosis is of course unfavorable. When severe ulceration occurs there is danger of perforation and its consequences; and even if this does not produce perforation, or in any way prove fatal, the cases are apt to be much protracted and the recovery incomplete.

The cases of muco-enteric inflammation produced by sewer gases and other miasmatic poisons vary in severity according to the peculiar character of the cause, and no very definite statement as to prognosis can be made. However, a very large proportion of such cases in adults terminate favorably. In children, the prognosis is not so favorable.

The frequent occurrence and consequent great interest of muco-enteritis, has seemed to me to require as full a description, at least, as has been given of it, and a careful account of the principles of its management in the different varieties will be required.

TREATMENT OF INTESTINAL CATARRH.

In the mild forms of the simple variety of intestinal irritation and catarrh of those above infancy, depending upon excessive food or irritating ingesta, temporary fits of indigestion, or upon taking cold, very simple treatment in most cases will alone be required. In many cases the diarrhœa excited will lead to the removal of the irritating causes, the free exudation will unload the vessels and relieve the fluxion, and the disease will thus cure itself. The food, however, should be suspended, or only the lightest forms be taken; mucilaginous drinks may be advised; a cataplasm may be applied to the abdomen, and, if there be much irritation without free evacuations, a laxative, as a Seidlitz powder, a dose of citrate of magnesia, or of castor-oil, may be given, to which a few drops of spirits of camphor, or of elixir of paregoric or laudanum may be added, but not enough of these latter articles to interfere with the operation of the laxative.

After proper evacuations, should the irritation continue, an opiate may be given, and, in due time, repeated if required. It is important, however, that the early evacuations should not be prevented, as they are useful in the removal of the cause.

In all cases the causal indication should be followed when it is possible. If the fluxion is the result of taking cold, diaphoretics are indicated. If no irritating materials are in the alimentary canal, a Dover's powder may be given at once, and repeated, if required, until its full anodyne and diaphoretic effects are realized, aided in the latter effect by warm drinks and external warmth.

Dysmenorrhœa, hemorrhoids, or gout, if acting as causes, should be treated according to their own indications, while the condition of the bowels is palliated. Evacuations should not be prevented, but all means tending to irritate the congested and inflamed membrane should be avoided as far as possible, or as consistent with all the other indications.

In the graver forms of muco-enteritis, with more pain, tenderness, and fever, with or without diarrhœal evacuations, more energetic treatment is required. When the disease is chiefly confined to the mucous membrane, and especially when irritating materials are presumed to be present, mild but efficient evacuants should at once be resorted to. A few grains of calomel, to which may be added five or six drops of laudanum, or from the twentieth to the sixteenth of a grain of morphine (and if the pain be violent and spasmodic, a larger quantity of the anodyne may be added without interfering with the evacuations), and soon after a decided dose of a saline cathartic—sulp. of magnesia, or sulp. of soda, or Rochelle salts—or a dose of castor-oil should be given, and the operation may be aided if necessary by an enema. These cathartic medicines will produce very little irritation, less than would be produced by the retention of the matters that may have caused the inflammation, and a free secretion from the mucous surface tends to relieve the engorged vessels. The peristaltic contractions of the intestines induced by the cathartic are not particularly objectionable, as the muscular and peritoneal coats are not involved; and the increased intestinal action temporarily produced by the medicine is likely to be followed by greater repose. After the evacuations, opiates are to be given in doses sufficient to produce decided anodyne effects, and to thoroughly allay the intestinal irritation. If diarrhœa persists, it should not be abruptly checked by astringents, and indeed, while the inflammation possesses anything of an acute character, astringents should be avoided entirely, unless the copiousness of the discharges immediately produces severe exhaustion, and causes danger of collapse. Even then, opium is the chief remedy to be used to check the too profuse discharges.

In sthenic cases leeches may be applied on the abdomen or near the anus, or in very plethoric and vigorous patients a venesection even might be justified. These measures, however, are not often required unless the patients are decidedly plethoric, the opiates and fomentations, and in some cases warm-water enemas, and sinapisms and other forms of counter-irritation being more effectual and less depressing. When plethora is present, the loss of blood may be a relief to the general system while diminishing the phlogistic state of the intestinal membrane. At a later period, if the disease persists and the diarrhœa is free, bismuth in doses of from fifteen to thirty grains, with proper doses of opium or morphine may be given, and when the case approaches a passive condition, with continuance of the diarrhœa, more decided astringents—as acetate of lead, tannin, or the astringent preparations of iron—may be useful. In many of the more subacute or chronic cases the turpentine emulsion, such as was recommended in the diarrhœa of typhoid fever, will be found particularly useful. (See formula, page 274.)

During the progress of the disease alkalies should be given to prevent the intestinal contents from being acid and more irritating; or the carbonates of soda or potash freely diluted in mucilaginous drinks, and small doses of ipecac., combined with them or the opiates, may be useful as determining to the cutaneous surface.

If the secretions be much perverted, the tongue foul, and the liver inactive, small doses of a mercurial—calomel, blue mass, or mercurialized chalk—may be given for a short time, and if the discharges are not free, a mild laxative may occasionally be administered. The diet should be carefully guarded in all cases. Articles of food easily digested and leaving but little residuum should be selected, and at first but moderate quantities must be allowed. Milk, generally brought to a scald, with thoroughly cooked farinaceous substances intimately mingled with it, will generally be found best, though well made beef-tea, with a little cracker soaked in it, alternated with the milk, or milk and lime-water, two parts of the former with one of the latter, may be found to agree well. In some cases more solid food will be borne, and will give more substantial nourishment to the system; such as rare, tender beef, a poached egg, thoroughly boiled rice, etc.; but in all cases articles should be selected as completely digestible as possible, which will leave but a small quantity of rough residuum to pass over the inflamed surfaces of the bowels. In some cases where the stomach is irritable, and the case is complicated with gastritis, bits of ice swallowed procure relief; and some recommend bags of ice applied over the stomach and bowels in acute cases. Sometimes in advanced and persistent cases a blister applied over the abdomen procures marked relief. As in other cases, the surface of the part to which it is to be applied should be rubbed with warm vinegar until the skin is reddened, the cantharides plaster should have its surface moistened by a few drops of oil of turpentine immediately before its application; and when the cuticle is raised, the blister should be dressed either by a very soft poultice, to be carefully changed, or by a thick padding of fine cotton-wool, allowed to remain without disturbance until the blister heals, unless the discharge from the blistered surface renders a new dressing desirable.

In protracted cases with much exhaustion tonics may be required, and for this purpose tonic doses of quinine, and in anæmic cases the milder preparations of iron will be found best.

In the intestinal catarrh of children the same general principles of treatment are applicable, and the same general plan should be pursued; doses and details being adapted to the infantile state. The food of infants is a matter of great consequence, and often of much difficulty, in this and other infantile diseases. The milk of a good nurse is, of course, the proper food of a young child, and if the mother does not fulfill this requirement, a suitable wet nurse, if possible, should, as a rule, be obtained. If the disease comes on gradually at the time of weaning, the procuring of a wet nurse may of itself suffice to restore health; but in most cases of muco-enteritis this is not sufficient. Indeed, in some instances other articles of food than human milk agree better. There are many particular articles that are approved by different practitioners, and are described in special works on the food of infants, and on the diseases of infancy, to which the reader is referred. The subject is of such importance that it requires careful study, but the full details cannot be entered upon here.

It is often found in general practice that the mother's milk does not agree with the child, and the circumstances render the obtaining of a good wet nurse out of the question. In these cases good cow's milk, properly managed as to the proportion of its ingredients, the quantity allowed, and the time and manner of giving it, will often be better than the milk of any procurable nurse. The cow should be healthy and not old, and for a young infant especially, her milk should be new. She should have a good clean pasture, free from weeds, such as garlic, etc., which would affect the milk; and in winter she should have a clean properly ventilated stable, and should be fed on fresh, clean hay, with but a small quantity of meal of any kind, and that mixed with pure water. The milk used for a child should be from the same cow. It should be allowed to stand a definite time, a certain proportion of the top to be taken, diluted with pure water, and a sufficient amount of sugar (better pure sugar of milk) should be added to approximate mother's milk. The younger the child, the larger should be the proportion of cream and water, and consequently the smaller the proportion of the caseous element of the milk. This food should be given at regular intervals from a nursing-bottle kept scrupulously clean by frequent scalding in boiling water; to a well child not oftener than once in from three to four, or, in the night, once in six hours, and in quantities sufficient to fairly satisfy a healthy appetite—generally a free allowance—and the proportions of the ingredients, the cream, milk, water, and sugar, should be carefully *measured*, not roughly guessed at, and the whole process should be carefully, steadily, and uniformly conducted.

I have often known puny, fretful, and sickly children restored to health, vigor, and comfort by being taken from the mother's breast and fed systematically upon this plan. When the child nurses, it should take its food at regular intervals; and to ward off attacks of intestinal catarrh all reasonable hygienic rules should be observed. During the teething period the gums should be examined from time to time, and if swollen and inflamed they should be lanced deeply enough to reach the coming tooth.

When an attack occurs the quantity of food should be more restricted, adapted with discretion to the particular case, under the direction of the physician, and not left to the chances of the crude notions of uninstructed mothers or ignorant nurses. If quantities of casein or curdled milk pass in the discharges, it is evidence that more of that ingredient has been taken than the stomach can digest, and that, instead of affording nourishment, it has become a source of irritation. Sometimes Liebig's or other preparations of meat, very thoroughly cooked farinaceous preparations mixed with diluted milk, pounded raw or very slightly cooked beef, beef-tea, etc., will be found to agree better than the milk alone; or milk may be improved by the addition of a little lime-water. No precise directions to be followed in all cases can be given, but attention to the subject of diet and regimen must be unremitting in all cases of infantile intestinal catarrh. A single neglect or error in this respect may defeat all other efforts.

In the medicinal treatment of this disease in children, great caution is required. The delicacy and impressibility of the child must be considered, and it must be borne in mind that opiates, especially if they have not been given before, can be borne in quantities proportionally much less than with most other medicines. Mothers and nurses must be instructed, where any discretion is left to them in giving medicine, respecting the great difference in strength between laudanum and paregoric, and doses of any active medicine must be calculated with accuracy, and should generally be prescribed much diluted, so as to render mistakes less liable to occur.

Mild mercurials, especially when combined with an alkali, as soda, magnesia, or chalk, are generally well borne by children, and are frequently useful in correcting their stomach and intestinal derangements. But without going into minute details, which are more fully dwelt upon in works on diseases of children, I must content myself with repeating the statement that the same general principles must govern in the treatment of muco-enteritis in them as in adults. Alterative laxatives in the first instance, opiates and alkalies afterward, oily emulsions not unfrequently, astringents and tonics at a later period, fomentations and mild counter-irritations to the abdomen, leeches in some sthenic cases, great care of food, warmth and flannel during convalescence, etc., will be the chief measures demanding attention.

In the stage of exhaustion in intestinal catarrh, which results from the starvation and discharges which accompany it, the coma that often occurs, to a superficial observer, resembles that from meningeal inflammation and effusion, and it may be supposed that some inflammatory disease or some hyperæmia or effusion has occurred in the head. The remark is sometimes made that "the disease has gone to the brain." Should this opinion be followed by depleting measures of treatment—by leeches, cathartics, etc.—the most disastrous consequences would follow. The condition is that of cerebral anæmia, and the treatment indicated is supporting—nourishment, stimulants, and tonics. These should be resorted to, but with due regard to the state of the stomach and bowels. Quinine, ammonia, and alcohol, in free dilution, may be useful; but it should be borne in mind that for more permanent supporting effects foods are to be most relied upon. If the stomach rejects these articles they may be used by enema.

CHRONIC MUCO-ENTERITIS.

When muco-enteritis assumes a chronic form, either in adults or children, modifications of treatment will be demanded. Astringents and tonics, and local alteratives to the inflamed membrane may be required. I have already referred to the use of the turpentine emulsion in subacute cases, and this preparation is often adapted to those of a more decidedly chronic character. The astringent preparations of iron are often very useful, and none more so than the preparation of the *liquor ferri ternitratis* of the pharmacopœia. The muriated tincture and the persulphate, however, often answer well. Various vegetable preparations, of which tannin is the most active principle, often are very useful. Some of them, such as geranium maculatum (spotted crane's-bill), matico, hamamelis Virginica (witch-hazel), coto bark, etc., seem to possess properties that modify favorably the action of the tannin, which most of them contain, and may be used in proper doses.* Tannic and gallic acids, however, generally fulfill similar indications, and have the advantage of definite properties and uniform strength. With the view of preventing fermentation of foods, as well as of producing alterative local effects, carbolic and salicylic acids or creosote may be useful. Often these agents may be added in suitable doses to the turpentine emulsion. Preparations of bromine have also been recommended in chronic and ulcerative varieties. When aphthous conditions are present, either in the acute or the chronic form, chlorate of potash, in moderate doses, will generally be found useful. As a tonic to the intestines in their relaxed condition in these chronic cases, strychnine has obtained a very favorable reputation, and is sometimes followed by very useful results when other measures have failed. In protracted cases it is worthy of a fair trial.* It is given by some in connection with nitric or sulphuric acid. In order to give it more prominence, I have reserved until the present an account of the use of nitrate of silver in cases of chronic muco-enteritis. It may be given both by the mouth and by enema. When the lower part of the intestinal canal is the chief seat of the disease, its local use by direct application is more efficient than when the disease is higher up, and in this manner it is particularly applicable in chronic dysentery; but this and the disease we have been considering merge into each other, both being chronic inflammations of the mucous membrane, often accompanied with ulcerations, polypoid granulations, and other results of a long-continued inflammatory disease.

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* Formula for diarrhœa or subacute dysentery: ℞ Fl. Ext. Coto Bark, gtts. x; Tr. Opii. Camp., ʒj. M.—Dose, ʒj.

Given by the mouth, the silver is best prescribed in pill with opium, in doses of from one fourth to one or even one and one half grains three or four times a day. Its local application may be made to the rectum and colon, and possibly even higher in the canal, in the following manner: First, the intestine should be washed out with an enema of warm water. Then the patient should be placed upon his chest and knees, the hips being as much elevated as possible; a flexible tube, a rectal tube, or a large flexible catheter, should be carefully introduced and carried as far up as possible without serious resistance, and into it a solution of nitrate of silver, of the strength of from ten to twenty grains to a pint of pure water, should be slowly injected to the amount of some four ounces. This may be repeated, according as it is borne, once in one, two, or three days. Sometimes a much stronger solution, in smaller quantity, will be better (five or six grains to the ℥j). This may be followed after its evacuation—which usually soon takes place—by an injection of an aqueous solution of morphine.

If ulceration exists low in the bowel within the reach of a speculum, a stick of nitrate of silver may be applied, as to other ill-conditioned ulcerations, with marked benefit. In children as well as in adults, nitrate of silver may be used either by the mouth or by enema in suitable cases.†

Instances have been reported of remarkable success in very old and obstinate cases with commercial nitric acid in place of the nitrate of silver, applied by wrapping a small piece of wet cotton around the end of a stick or whalebone, and dipping the swab in the acid, touching lightly the swollen and ulcerated membrane, but not so as to produce sloughing. The greater number of the cases thus reported were of chronic dysentery with ulcerations, but the treatment is equally applicable to such chronic ulcerations, whether of dysenteric or any other origin. The operation will require to be repeated a few times at intervals of some days, soothing treatment being applied in the meantime, with the greatest care of the diet, the patient often being confined strictly to milk.

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* ℞ Nitric or Sulphuric Acid, gtts. lx; Strychnine, gr. jss; Water, ℥j. M. —Dose, a tea-spoonful in a drink of water.

† Formula for child one year old. ℞. Argenti Nitrat., gr. j; Acid. Nitric. Dil., ♏viij; Tinct. Opii Deod., ♏viij; Mucil. Acaciæ, ʒss; Syrup. Simp., ʒss; Aquæ Cinnamoni, ℥j. M.—Tea-spoonful three times a day. (Bartholow.)

These severe applications must be used with caution, by means of a duckbill speculum, with the patient in Sim's position, or upon the chest and knees, and often under the influence of an anæsthetic.

In all cases of chronic as well as of acute muco-enteritis, the causal indication should be observed, and, as far as practicable, followed.

Different forms of irritation and inflammation of the intestinal mucous membrane are often accompaniments of malarial diseases. In all such cases, quinine is an essential, and often a sovereign remedy. Indeed, in a region where a malarial influence is evident or suspected, I should not feel that I had done my full duty to the patient, in a case of much severity or of considerable continuance, unless I had administered an anti-malarial quantity of this agent. One will often be surprised at its efficacy in this as in many other inflammations, where there is no reason to suppose that paludal malaria has anything to do with the case.

When the disease is dependent upon phthisis, Bright's disease, obstructive disease of the liver or the heart, attention to these conditions will be important; and palliation of the symptoms may be effected when a cure is hopeless.

In some chronic cases of adults a strict milk diet is of service, and in all cases the diet should receive great care. Bismuth, or bismuth and pepsin, or either of these alone will often enable the patient to take food that otherwise could not be borne. Bismuth, in addition to its soothing qualities, has an astringent effect, and is well adapted to some cases.

A change of locality and climate will sometimes materially aid in the recovery of a patient, provided proper food and treatment can be secured on the way, and in the new locality.

TREATMENT OF CHOLEROID FLUXION.

In the choleroid form of fluxion to the digestive mucous membrane prompt treatment is often demanded. It is true that many cases after free evacuations will terminate favorably in a day or two without treatment; but it is also true that others accompanied with severe suffering will be protracted; and though the vomiting will at length cease, and the purging abate, the irritation and inflammation will continue for many days, and may become chronic; while some others, at an early period, will fall into collapse and die.

In these cases, usually called cases of sporadic cholera or cholera morbus, the physician is seldom called until free evacuations have occurred and all irritating matters have been removed from the alimentary canal. Before this has taken place, the vomiting and purging should not be interfered with. The vomiting may even be promoted by the drinking of free quantities of warm water; but one will sometimes be surprised to find that such a draught, especially if quite warm, arrests further emesis.

After free evacuations, the material passed being watery and colorless, a full opiate should be given and but little fluid taken for a time; a mustard plaster should be applied to the epigastrium and abdomen, and quiet and rest, as far as possible, enjoined. If the opiate is vomited up it should soon be repeated, and a repetition should take place every hour, more or less, until a soothing anodyne effect is obtained. A quarter, a third, or half a grain of sulph. of morphine, placed dry upon the tongue, and a small sip of water taken after it, will not be ejected, and its effect will soon be observed. Another excellent form of anodyne is two grains of opium, two of camphor, and perhaps three or four grains of calomel, rubbed into a very fine powder with loaf-sugar or sugar of milk, put into a single tea-spoonful of water, and taken with a sip of water after. This will also very generally be retained, and produce a speedy effect. In severe cases dry cups may be applied over the stomach and bowels, and, if the extremities are cold, warmth may be applied to them. Morphine used hypodermically is sure to produce its effect, and in some cases this is the preferable method of administration. Prof. Bartholow strongly advises an injection, hypodermically, of a combination of morphia and atropia, from $\frac{1}{8}$ to $\frac{1}{4}$ of a grain of the morphia to $\frac{1}{120}$ of a grain of the atropia. A single injection, as well as a single free dose of morphia on the tongue, will often be sufficient to arrest promptly the symptoms. A repetition of the injection within an hour is seldom required, and not altogether safe, but may be necessary if the symptoms persist after that time. Great care is necessary, with young and susceptible persons, to avoid giving an overdose; but, when the proper quantity is administered, the effect is often very striking, the vomiting and purging speedily cease, the pulse increases in force, the cutaneous circulation becomes more free, the surface grows warm, the cramping pains are arrested, and but little further treatment will be required.

If too long neglected the algid condition may occur, resembling the collapsed stage of Asiatic cholera. Then other means may be necessary to relieve this condition. Warm coffee, especially if large doses of the opiates have been given, or beef-tea well salted, with the addition of mustard, or a few grains of quinine repeated, may be required. In these algid conditions Bartholow advises hypodermic injections of chloral with morphia as more efficient than the morphia alone, or morphine with atropia.

Other means may aid the remedies already mentioned. Sinapisms may be applied with advantage to the abdomen, pellets of ice swallowed will often be grateful, and carbonic acid water, in moderate quantity, will frequently be well borne. In many cases small doses of calomel have a correcting effect upon the secretions, and aid in allaying the more immediate symptoms.

Some of the chlorodyne preparations are useful combinations in these cases, but the forms of anodynes already mentioned are sufficient for practical purposes.

These means will almost never fail to control the violent symptoms, and will generally prevent any serious consequences. If, however, evidences of inflammation continue, the treatment must be conducted as already described for intestinal catarrh. If it occurs in connection with malarial fever, full antimalarial quantities of quinine must be given as soon as the stomach will tolerate the doses. It may, in very exceptional cases, be necessary to give it hypodermically or by enema.

TREATMENT OF CHOLERA INFANTUM.

The choleroid form in children, or *cholera infantum*, requires very careful management, and unfortunately the best efforts not unfrequently fail of success. The same general principles apply here as in the cholera morbus of adults. The gums should at once be examined, and if swollen and reddened, they should be divided. If there should be reasonable evidence of irritating matters in the stomach, an emetic of ipecacuanha should be given; or, if the bowels have not been thoroughly evacuated, a laxative—a saline or castor-oil—should be given, or an enema administered. Usually, however, evacuations have fully occurred before the physician sees the patient, when means for allaying the irritation and arresting the discharges should be resorted to immediately. Opium, or its preparations, here, as in the adult, is the main reliance, and the same preparations and directions as before given are applicable here; the great difference as to the dose for children, in the case of this drug, being observed. However, the symptoms are so violent, and the danger of speedy exhaustion and collapse is so great, that the remedy must be pushed to the verge of safety, and the discharges arrested as soon as possible.

Sometimes small but repeated doses of acetate of lead and acetate of morphine seem more efficient in arresting the vomiting and purging than the opiate alone or in other combinations. The mixture of opium, camphor, calomel, and sugar, reduced to an impalpable powder, given in appropriate does, will also be found an excellent preparation.

I am aware that the utility of the opium preparations is questioned by some of high authority; that their use with children is not without danger, and that in some cases they fail even to palliate the symptoms. But in most such cases all efforts will fail, and it is quite possible that sometimes other means for arresting the discharges may be preferable; but cholera infantum is so similar in phenomena and pathology to cholera morbus in the adult, where the utility of opiates is so marked and unequivocal, that it can scarcely be questioned that, with proper precautions, bearing in mind the peculiar susceptibility of children to the narcotic action of these drugs, they may be of great benefit in this affection. According to my experience nothing is so likely to check the exhausting discharges; and where they are unchecked, death is the common result. Other prescriptions, such as bismuth and carbolic acid, five to ten grains of the former to one quarter or one half grain of the latter, every two hours, in a flavored emulsion (cinnamon water and gum arabic), to which an alkali may be added (bicarbonate of soda or potash), may be tried. Calomel alone, triturated in sugar and dropped on the tongue in small doses, often exerts a sedative and soothing effect, checking the vomiting when other means fail. Oxide of zinc, and oxide and nitrate of silver, also Fowler's solution in doses of one eighth to one quarter of a drop, have been advised; but want of experience with these articles, in these cases, does not allow me to express an opinion respecting their use. When all remedies are rejected by the stomach, as is sometimes the case, opiate and astringent enemas should be tried. Bits of ice may be wrapped in a cloth and placed in the mouth, and very small quantities of ice-water may be given to allay the thirst. Mild sinapisms may be applied over the stomach and bowels, but some advise the application of cold. The feverish temperature is sometimes very high, occasionally amounting to a state of hyperpyrexia. Cold sponging, the cold pack, or the bath, becomes an exceedingly important therapeutic agent in such cases. The child may be carefully placed in a bath at a temperature of from 90° F. to 100°, and cold water may be gradually added until it is brought down to 80° F., or even to 65° or 60°, if well borne, and continued for from eight to twenty minutes, until the heat of the body is materially diminished. The bath should be repeated if the fever again rises, and several in the course of twenty-four hours may be demanded. Where the fever has been very high, it is to be presumed it will become so again; and it should be anticipated and checked by the bath when it begins markedly to rise. The bath may be aided, where the stomach will allow it, by antipyretic medicines—quinine, or salicylate of soda.

After the profuse discharges are arrested and the more violent febrile symptoms, where they occur, are controlled, the subsequent management of the case is to be conducted on the same general plan as other cases of muco-enteritis with similar symptoms. If the prostration be great, stimulants and tonics may be required, but great care must be taken not to introduce into the stomach irritating substances. Cholera infantum has been regarded by some as a specific pyrexial affection, produced by some peculiar poison generated in the heat of summer in populous places, mostly in large cities. Its analogy to malarial fever has suggested the use of quinine, and not unfrequently a few decided doses of this remedy not only abate the fever but change favorably the character of the disease. When a malarious influence is present, it is of course an important remedy. A variety of special remedies and prescriptions have been advised, but there are no specifics for the disease, and it must be treated according to the symptoms presented.

Great care must be taken of the diet throughout. When the danger of vomiting is past, more free quantities of water may be allowed, for if restricted, larger quantities of milk, either from the breast or bottle, are apt to be taken to quench the thirst, than can be digested, and thus the irritation is increased. Scalded milk diluted with lime-water will often be as well or better borne than any other form of nourishment. Removal to a healthy situation in the country is generally advised, and is often essential to restoration.

In all such cases of enteritis, as the patient convalesces, care must be continued respecting the diet, and the patient must be guarded against taking cold. The feet should be well protected; and undergarments of flannel should be worn, and often a flannel bandage should be applied about the abdomen.

PHLEGMONOUS INFLAMMATION OF THE INTESTINES.—ENTERITIS.

By these terms is understood an inflammation of the small intestines, involving not only their mucous, but their muscular and peritoneal coats. This form of intestinal inflammation is much more rare, but much more severe and dangerous, than most of the varieties of intestinal catarrh. In this, while all the coats of the intestines are involved, the inflammation does not extend to so large a portion of the viscus as is usual in muco-enteritis.

Etiology.—Attacks of this kind are more likely to occur in young persons, but may happen at any period of life. The exciting *causes* are those of inflammation in general—taking cold, the ingestion of irritating substances, accumulation and retention of fæcal matter, blows or other physical injuries, etc. I have seen several cases which occurred in young persons after an evening party in heated rooms where refreshments were freely taken, including nuts, and where afterward there was exposure to cold on returning home.

Symptoms.—The symptoms vary in severity and somewhat in character, depending upon the locality and extent of the part involved. In cases not depending upon mechanical injury or hernial strangulation, the patient is usually attacked with pain, at first resembling colic. Soon, however, and sometimes simultaneously with, or even preceding the pain, a chill is felt, followed by fever, often then with increase of the pain, which becomes more continuous, and is accompanied with *tenderness* and sometimes with tormina. Nausea and vomiting are not unfrequent at this stage, but are by no means constant symptoms. The pulse becomes rapid, and though often full at first, it at length becomes smaller, sometimes hard, and sometimes oppressed and feeble; the countenance is contracted and indicates much suffering, the abdomen becomes distended and tympanitic; sometimes movements of the bowels take place, but more frequently there is constipation. If a cathartic is taken it usually fails to operate, at least satisfactorily, and the pain and suffering are increased by it. The tympanitis continues to increase, and in the severer cases the progress of the disease is rapid, the pulse becomes weaker and more frequent, hiccough becomes distressing, free vomiting of dark and sometimes stercoraceous matters comes on; the pain at length may cease or greatly abate, a clammy sweat breaks out, and collapse and death follow; the fatal cases sometimes terminate within thirty-six or forty-eight hours, and are seldom delayed beyond a week.

Sometimes the disease is more insidious in its approach. When the peritoneal coat is largely involved, the tenderness is marked, the pain is great, and the decubitus is dorsal with the knees drawn up. When the peritoneal coat is less involved, the inflammation being mostly in the mucous and *muscular* tunics, the pain may be slight at first, and all the symptoms less marked and severe; but the disease is apt to go on, the muscular coat becomes paralyzed, constipation more or less complete takes place, the abdomen is distended, vomiting often supervenes, and the case may progress to a fatal termination, as in the forms which commence with more suffering.

The intellect usually remains intact, but sometimes toward the last the mind wanders, or a deep somnolent or lethargic condition occurs.

Though phlegmonous enteritis is so severe and dangerous, and so often fatal, yet the severity sometimes is less; or under proper treatment the disease soon subsides, and recovery after a greater or less length of time takes place.

Morbid Anatomy.—The *morbid anatomy* and *pathology* of this affection are worthy of particular notice. On *post-mortem* examination a portion of intestine, commonly of the ileum or jejunum, is found injected, infiltrated, and thickened, and generally effusion has occurred from the peritoneal coat, and false membrane has formed upon its surface. In short, a portion of intestine, varying in length from several inches to several feet, presents all the evidences of a severe inflammatory process in the mucous, muscular, and serous coats. The serous surface often presents a dusky red, sometimes a slaty or purplish black color, due partly to its own engorgement, and partly to the condition of the parts beneath—its own congestion being often in streaks or patches. There are often blotches of subserous extravasations, and on the outer surface larger or smaller quantities of adherent lymph, and sometimes there is free sero-purulent extravasation. Often the folds between portions of intestine are filled with lymph, and when the case has continued a sufficient length of time this lymph may be organized, and adhesions and fibrous bands may be formed. Death may be caused at a much later period by intestinal obstruction from this cause. The mucous and submucous tissues are generally thickened and softened, are more or less congested, presenting spots and streaks of extravasation, sometimes almost black from congestion and escape of blood into the tissue, sometimes of a paler color from infiltration of lymph or pus, and sometimes black from gangrene.

Sometimes the inflammation extends from the inflamed intestine over a considerable portion of the peritoneal surface, causing more extensive effusions; and occasionally rupture of the inflamed intestine has taken place. From the involvement of the muscular coat its fibres are paralyzed, and the affected portion is generally distended with the fæcal contents, and sometimes with extravasated blood. The line between the healthy and diseased portion of the intestine is generally well marked, and often quite abrupt. While the inflamed part is paralyzed and distended, the part immediately below is contracted and nearly empty. The paralysis of the diseased part, and the contraction of the irritated but uninflamed portion below, prevents the passage of fæcal matter, and accounts for the constipation so common. Above the inflamed part there may also be more or less distention from the accumulation of liquid and fæcal matter produced by the obstruction; and this accumulation may be so great as to cause regurgitation into the stomach, and induce the offensive vomiting which sometimes takes place before death.

Diagnosis.—The diagnosis of Phlegmonous Enteritis should be carefully made, as it resembles some other diseases whose treatment should be different. It should particularly be distinguished from colic, from strangulated hernia, from the tenesmus of dysentery and the tormina of diarrhœa, from certain diseases of the brain, from poisons, from hysteria, and, what is less important, though often quite as difficult, from peritonitis, from renal calculi, and from mechanical obstruction, or ileus.

It is to be distinguished from colic by the absence of fever and tenderness in the latter; by the spasmodic character of the pain; by the movements of the patient during the paroxysms of colic; and by the relief which is obtained by fæcal or gaseous discharges. It is distinguished from strangulated hernia by the usually sudden occurrence of the latter without the preceding chill or fever; by the strictly local, circumscribed focus of the pain and seat of the tenderness; by the more certain and repeated vomiting; and by the presence of a tumor. From the tenesmus of dysentery and the pain of diarrhœa, by the discharges in these affections, and by their general course; from diseases of the brain, by the presence of other cerebral symptoms; from irritant or corrosive poisons, by the history of the case, the taking of an irritant material, the burning pain in the stomach, and the more rapid progress; from hysteria, by the absence of fever, by the greater tenderness on slight and less on firm pressure, by the free discharge of pale urine, and other hysterical phenomena; and it is to be distinguished from peritonitis by the more diffused character of the pain and tenderness in the latter. Enteritis is distinguished from the passing of renal calculi by the location and more remitting character of the pain, the absence or slight character of the fever in renal colic, and, when the calculi are passing through the ureters, by the irritation and pain extending to the genital organs and down the thigh, and by the frequent micturition which occurs; and, finally, this disease is to be distinguished from mechanical obstruction by the history of the case, the presence often of an abdominal tumor, the more persistent and more stercoraceous vomiting, and by the less remediable character of the symptoms when such obstruction exists.

Prognosis.—The prognosis of Phlegmonous Enteritis is always grave, though it will depend upon the extent and severity of the inflammation, the state and power of endurance of the patient, and the treatment he may receive.

Treatment.—In many cases of this disease, as the symptoms will generally be supposed by the patient and friends to be caused by some crude or irritating matter in the alimentary canal, when a physician is called, a cathartic, and sometimes a harsh one, has been taken. The distress has increased, and it is quite likely the cathartic has not operated, or but slightly and imperfectly. The inflamed muscular fibres are already so paralyzed, and other portions of the intestinal muscles are thrown into such irregular action, that the proper, continuous, peristaltic motion is not produced, but increased irritation and afflux of blood, and increase of inflammation have been the result of the cathartic. Should additional cathartics be given, additional irritation and serious aggravation of the disease would, in all probability, be produced.

The first thing to consider is the question of giving or withholding cathartics, and the impulse to rush to the administration of active purgatives must be resisted. If there is evidence that the bowels are loaded, and that the presence of their contents is the cause of the inflammation, a warm-water enema may, with great propriety, be given, and perhaps repeated; and if the case is seen very early, or if the inflammation is confidently believed not to be so severe or so far advanced as to have paralyzed the intestine, and if there is good reason to think that an ordinary moderate dose of a saline or of castor-oil will procure evacuations and the removal of irritating matters, such dose may justifiably be given, and its effect aided by enemas. Beyond this the use of purgatives must not be carried; and when the disease is at all advanced, and of such severity as to produce the paralyzed condition of the intestine indicated, the administration of cathartics, however mild, can hardly fail to do harm. The point as to the propriety of giving laxatives at all, however early in the disease, and whatever the circumstances, is one of great delicacy and difficulty, which should be left to the discretion of the physician after a careful diagnosis has been made and an intelligent and deliberate judgment formed, considering all the facts and probabilities of the case.

Generally as patients are seen in this disease cathartics are entirely inadmissible. There can be no serious objection to the administration of a simple enema when fæcal accumulations exist in the lower bowels at the beginning of the disease. Impacted fæces are not likely to be in the small intestines, however, where the inflammation usually is seated, previous to its occurrence, as their contents are fluid or semi-fluid, and such impaction is not likely to be a cause of the attack. At all events, experience has abundantly proved that the use of active cathartics in cases of phlegmonous enteritis has produced great mischief, and the imperative rule of practice forbids them.

No practice could be worse than the administration of gamboge, croton-oil, and similar articles in cases of this kind. The constipation is not usually to be overcome in this manner, the paralyzed and deranged intestine cannot thus be restored to its proper activity, and all excitement of the action of the intestine above can only drive its contents with more force into the paralyzed, distended, and inflamed portion, increasing the suffering and the disease. The inflamed part itself is irritated by the more direct action of the medicine, the blood is determined to it still more, and all its morbid conditions are likely to be increased.

The indication in these cases is to allay irritation and overcome the inflammation. A leading object in the treatment of an acutely inflamed part is to keep it at rest. No remedy is so strongly and clearly indicated in phlegmonous enteritis as opium or its preparations. A full dose of morphine or some other opiate should at once be given, and repeated as may be necessary to bring the system and keep it under its full anodyne effect. The effect upon the pupils, the respiration, the circulation and aeration of the blood, and all the conditions of the patient should be carefully watched, a too depressing narcotism on the one hand, and an action too feeble to induce the proper quieting effect on the other, should alike be avoided. The first dose of morphine may be from one fourth to one half grain, according to the susceptibility of the patient, and it should be repeated, perhaps in smaller doses, but always according to its effects, once in from three to four or five hours. Small doses of a mercurial may be added to prevent the opiate from diminishing too much the secretions; and if there be high excitement of the pulse with much cardiac force, veratrum viride or aconite may be added to control that action. If, from the shock or other cause, the action of the heart becomes too feeble, the latter articles must be discontinued, but the effect of the opiate must be steadily maintained.

The propriety of adding to the opiate free doses—from six to ten or fifteen grs.—of quinine, until the feverish heat is markedly diminished, has not yet the sanction of long experience authority; but I cannot question, in many cases at least, not only its propriety, but its exceeding efficacy. The influence of this article as an antipyretic and anti-inflammatory remedy has already been discussed, and these phlegmonous intestinal inflammations are not exceptional in yielding to this remedy. Salicylate of soda may be found as useful, but as yet it has not been sufficiently used in cases of this kind to determine its value.

The question of aiding the antipyretic and anti-inflammatory effect of these agents by the cold bath, or the local application of cold, is one of much interest, but as yet not fully decided. Fever might in this way be abated, but whether the blood might not be driven internally, and the hyperæmia and inflammation of the intestines increased by the cold, especially by the general cold bath, is a point of the greatest interest, and requires to be more fully settled by general experience. Those who have used the bath most in typhoid fever say that hemorrhage of the bowels in that disease is, for the time, a contra-indication to the bath. Whether the danger consists in adding the shock of the bath to the depression from the loss of blood, or whether the danger is from driving the blood internally and increasing the flow, or from the physical disturbance and danger of rupture, has not been determined, or at least has not been generally and clearly expressed. The question of the general use of cold in enteritis must be regarded as sub judice. Testimony, however, is accumulating in its favor.

But there are other measures worthy of consideration and use. Even so conservative a writer as Bristowe says: "The abstraction of blood is often of the greatest value. This is most efficacious early in the disease, and may be effected either by the opening of a vein in the arm, or by the application of ten, twenty, or thirty leeches to the surface of the belly." I do not doubt the frequent efficacy of the abstraction of blood. It is by no means inconsistent with the opium, or opium and quinine treatment, and in plethoric and vigorous patients, with a firm action of the heart, it is not only frequently advisable, but sometimes very important. It is, however, less to be relied upon than opium, or opium and quinine, and must not interfere with their use. Hot fomentations, and other light and warm applications generally soothe; and not unfrequently mustard plasters or other mild counter-irritants give some relief. Enemas of warm water or some bland fluid, cautiously given, sometimes produce a soothing effect, but they must not be so given as to irritate the patient, or tease and agitate the inflamed intestines. When vomiting or hiccough is troublesome and distressing, a mustard plaster, or, if they do not produce pain, dry cups over the epigastrium, may be applied;

and bits of ice, hydrocyanic acid, alkalies, or lime-water, and sometimes moderate doses of creosote in some bland fluid may be tried. The last-named article I have sometimes seen produce a very prompt effect, arresting the hiccough and vomiting without increasing irritation. When the vomiting is the result of the accumulation of fluids and of overdistention of the bowels and regurgitation into the stomach from the obstructed passage downward, measures for quieting it are generally ineffectual, and not unfortunately so, as the discharge of these matters gives relief.

The great prostration, which is so apt to be early manifested, is an evidence of shock rather than failure of the nutritive functions of the system, but still light and nourishing articles of food are indicated. They can usually be borne by the stomach only in small quantities, and may often be given best by enema. When the shock and depression are very great, and not relieved by the opium and quinine, alcoholics may be given, generally best with beef-tea and a little laudanum, by enema. When not well borne by the stomach, the opiates and quinine may be given by enema; or morphine certainly, and perhaps quinine, will sometimes be better given hypodermically. Morphine hypodermically, in doses of one fourth or one third of a grain may be given, but the quantity and repetition will depend upon the severity of the pain and the susceptibility or power of endurance of the patient; and the effect must be carefully watched, and the doses administered accordingly. Too profound an effect must not be produced, and it is thought that by combining atropine with the morphine, the physiological or poisonous effects of the morphine may be antagonized, while the medicinal effect is increased, or at least not diminished.

This combination for therapeutical purposes has not as yet obtained the general sanction of the profession from extended experience, but is strongly recommended by a few writers whose opinions are worthy of respect. A quarter of a grain of morphine, and $\frac{1}{120}$ of a grain of atropine, would be an ordinary dose to begin with in an adult, the time and size of subsequent doses to be governed by the effect. A steady, decided anodyne influence should be maintained.

As the inflammation subsides, the action of the paralyzed intestine is restored, and as the spasm of the contracted part below is overcome, the bowels will usually move spontaneously, and often freely and repeatedly; but even should their movement be much delayed, nothing more should be done to promote it than simple injections of warm water, and, as a rule, these should be used only when a sense of uneasiness in the lower bowels indicates an accumulation of fæcal matter there, and a tendency to, and desire for its evacuation. I have not unfrequently known the inflammation to be revived after it had largely subsided, and the most disastrous consequences to follow the administration even of a dose of castor-oil, given because movements of the bowels were delayed. Too much caution on this point cannot be observed. When the patient is gradually improving, by all means "let well enough alone." For the fact that no movement of the bowels has occurred for several days, or one or two weeks or more, when but little food containing residua has been taken, is of itself of very little consequence. It is, however, of the utmost consequence not to irritate a part just recovering from a severe inflammation, nor to fret and render a part more painful which is still inflamed, nor to subject to violence an intestine softened and enfeebled by the inflammatory process, and ready to undergo laceration. Where the inflammation lingers, a blister will often be of service.

As convalescence advances, great care respecting food and exposure should be continued until the recovery of the diseased intestine is complete.

INFLAMMATION OF THE CÆCUM AND NEIGHBORING PARTS.—TYPHLITIS AND PERITYPHLITIS.

Typhlitis is an inflammation of the walls of the cæcum. When inflammation of the mucous surface occurs as a part of entero-colitis, it presents no peculiarities which entitle it to a separate consideration. Occurring by itself, it has special features that require notice.

The disease may result from the ordinary causes of enteritis, the inflammation having that limited locality; but this is unusual. It commonly results from the presence of foreign bodies lodged there, or from the retention of fæcal matter. It is often preceded by constipation, though occasionally by alternations of constipation and irritative or catarrhal diarrhœa. It is marked by pain in the right iliac fossa, generally continuous but exacerbating, and increased by pressure; by a sense of soreness, often produced by a jarring movement, as by stepping firmly upon the heel; by an elongated cylindrical tumor, more or less distinctly defined, quite abruptly below but less so above; and by general sensations of uneasiness and depression. The tumefied condition, when considerable, is caused mostly by fæcal accumulations; but some degree of enlargement is caused by thickening of the walls of the intestine, and in these cases the muscular, as well as the mucous, coat is involved and more or less infiltrated. When the tumefaction is stercoraceous, it is quite dull on percussion;

but when it is caused by swelling of the intestinal walls, it presents only a moderate decrease in the sonorousness.

As the muscular coat is involved in the inflammation, it is usually more or less paralyzed, causing constipation at that point; but if a catarrhal irritation exists in other portions of the intestines, the fæcal matter will be more or less liquid, may be forced through the short paralyzed portion, and diarrhœa may be present. The fæcal accumulations are sometimes large, reaching to the ileo-cæcal valve and causing occlusion of the intestine. When the inflammation is caused by foreign bodies, it is commonly more acute, and is accompanied by some degree of fever; but in the simple stercoraceous forms but little or no fever is perceptible.

This form of cæcal disease is not usually very severe, and commonly terminates in resolution. It may, however, result in ulceration and perforation, especially when produced by some foreign substance; and without such ulceration the inflammation may extend to surrounding parts, giving rise to perityphlitis, to peritoneal inflammation, or to infiltration and abscess of the cellular tissue in the iliac fossa in which the cæcum is imbedded. Should ulceration and perforation occur on the posterior portion of the intestine, where there is no peritoneum, an abscess might form and become encysted, and at length might be discharged into the intestine by reperforating its coats, or it might travel in other directions, sometimes penetrating the bladder or rectum.

The Appendix Vermiformis is also subject to inflammation, ulceration, and perforation, causing peritonitis or encysted abscesses, which may take a similar course, and in a majority of the severe and fatal cases of inflammation in this region this is the seat of the disease. Small foreign substances, such as cherry-pits, bits of bone, concretions of mucus, and fæcal matters mixed with calcareous substances, lodging in the vermiform process cause irritation and often a small ulcer, producing but moderate symptoms until penetration takes place, when matters from the intestines—gases, fæcal substances, etc.—may pass into the peritoneal cavity and induce a speedy general peritonitis; or adhesive inflammation may take place, and an abscess form, which may open into the peritoneal cavity, or travel in various directions like those connected with cæcal inflammations and perforations.

But *perityphlitis* may occur without preceding inflammation and ulceration of the cæcum or vermiform appendix, and its different forms will soon be considered.

Diagnosis.—It is by no means easy to distinguish between typhlitis and perityphlitis, or between these and occlusion of the bowels from other causes. Comparisons, however, will be made after perityphlitis is described. In the milder forms of typhlitis there will be local fullness, soreness, and pain, without impaction; while in the severer forms there will be obstruction, with symptoms much like those which occur in obstruction in other pathological conditions. A cancer of the cæcum, in its earlier stages, may present similar appearances, but its history and progress will be different; a harder, more distinct, and more nodulated tumor will be present, and the cancerous cachexia will at length make its appearance.

Treatment.—When a moderate degree of irritation and tenderness is felt in the region of the cæcum, in connection with constipation, and on examination a tumefaction is found in the part, when the normal sonorousness is absent on percussion, and when pressure with a single finger with some firmness for a little time leaves an indentation, the tumor is fæcal and the difficulty is due to constipation. The judicious administration of cathartics, at first saline to induce a watery state of the intestinal contents, and afterward more tonic laxatives—in short, treating the constipation, directing a proper diet, etc., as will hereafter be described for constipation—will usually be successful in overcoming the disease. Should tenderness, irritation, and pain continue, and some thickness of the cæcal walls be discovered, in addition to the means necessary to keep the bowels open, counter-irritation should be applied by some irritating liniment, or, better still, by a cantharides blister. The case should continue to receive attention, since the difficulty when it once occurs is apt to linger or frequently return. The muscular coat of the intestine becomes weakened, accumulations recur, and the case requires care as to food, exertion, and exposure, and often a continuance of treatment.

When the disease depends upon other causes than constipation, they must be sought out, and if possible removed. If the symptoms are more acute, leeches should be applied, followed by fomentations, perfect rest should be enjoined, a bland diet prescribed, a general course as for local inflammations elsewhere should be pursued, not omitting blisters, which often have a very decided influence in controlling the inflammation.

If ulceration and rupture are feared, great caution is required. Spanæmics should be avoided, since a plastic exudation, which will limit the threatened abscess, furnishes the only hope of preventing the diffusion of matter, with its most serious consequences. The bowels must be kept soluble, but active purgatives are inadmissible; indeed, unless there is evidence of accumulation of fæcal matter operating as a cause, the bowels should be kept quiet. Chlorate of potash in moderate doses might be given. Coarse food that leaves much residuum should be avoided; rest in bed should be insisted upon; and any general morbid condition of the system should be treated according to its character and indications. Various tonics, and especially the tincture of iron, may be useful to prevent spanæmia and to favor a plastic condition of the blood and tissues.

The same course of management will be required when the vermiform appendix is the seat of an inflammation, and an ulcerative process is apprehended. The symptoms, until a rupture takes place, may be indefinite. Some uneasiness and obscure tenderness, or occasional pains without tumefaction, may be all that is noticeable. The greatest care is now required, as the danger is greater than when the disease is in the colon. In the latter case the rupture, if it occurs, is likely to be in the posterior part of the intestine, behind the peritoneum, through that part of the cæcum not covered by that membrane. In case of perforation of the appendix, the discharge of gases and other intestinal contents will be within the peritoneum, and unless the ulcerative process is preceded by adhesive inflammation, the discharge will be loose in the cavity of the abdomen, and a violent and fatal peritonitis will, in all probability, be the result. A watchful care, positive rest, and the most judicious management will be required when there is reason to suspect a foreign substance inducing an ulcerative process in the vermiform appendix.

PERITYPHLITIS.

Perityphlitis is an inflammation about the cæcum, and whether originating outside of the cæcum or its appendix, or occurring in consequence of disease of these parts, when established it presents other symptoms than those present when the disease is confined to the cæcum or the appendix. The pain is now severer, the movement of the right thigh is painful and difficult, there is more fever and general disturbance, and the tumefaction is deeper and different in form.

The term perityphlitis includes all the inflammations about the cæcum; but an inflammation with infiltration and a tendency to suppuration occurs in the iliac fossa, behind the peritoneum, in the loose cellular tissue in that region, which is called by Jaccoud, "Phlegmon iliaque;" and others have proposed that it should be called paratyphlitis. It is a retro-cæcal phlegmonous inflammation, and requires more particular notice.

Etiology.—Its common causes are ulceration and perforation of the ileo-cæcal appendix, especially when it gives rise to the formation of a stercoraceous abscess in this location. It may arise from fæcal accumulations in the cæcum and at the sigmoid flexure of the colon;

in the latter case it affects the left iliac fossa. Intestinal concretions, formations of the phosphates of lime and magnesia, or portions of various substances received as ingesta, lesions of the upper part of the rectum, and lastly the puerperal state, may give rise to these iliac phlegmons. These iliac phlegmons may also be caused by inflammation of inguinal lymphatic glands (adenitis), by inflammation of the ovaries, or peri-uterine affections not puerperal; by renal, hepatic, and pleural suppurations descending to this part; and subaponeurotic abscesses may occur from psoas inflammations and caries of the vertebræ; and they may also be caused by wounds, blows, excessive exertion, and by the action of cold. Subperitoneal phlegmons arising from intestinal lesions are commonly on the right side, those from uterine and peri-uterine disease are rather more frequent on the left.

Anatomically these phlegmons present differences depending upon their causes, particular localities, and modes of termination. When produced by inflammation of the intestine from a foreign body or other cause, the abscesses are likely to be extended; when due to adenitis they are more circumscribed, and are near the vessels, the pus in these cases tending upward in the abdomen, and not so much into the iliac fossa. In the puerperal state they are apt to extend rapidly and invade different parts.

Peritonitis, circumscribed or general, frequently complicates these conditions, particularly in the puerperal cases. A purulent sac may extend, as stated by Grisolle, from the crural arch to the false ribs.

If an abscess deep behind the peritoneum continues long, the psoas and neighboring muscles are apt to become involved and disorganized, the fibres becoming soft and black. The nerves are not generally affected seriously, but possibly they may be dissected out by the pus and some filaments may become detached. A case has been reported where the pus found its way into the vena cava. When perforation of an intestine occurs from an ulcer or inflammation within it, fæcal matter is apt to escape; but if reperforation occurs from the outside—if an abscess without opens into an intestine—the escape of fæcal matter is said not to take place.

Symptoms and Course.—When ulceration and rupture of the vermiform appendix occurs, violent peritonitis, marked by severe pain, probably a chill, a fever, a rapid pulse, abdominal tenderness, etc., is apt to come on suddenly. The pain and inflammation may be more limited, adhesions may take place, and a circumscribed abscess may form. It may afterward rupture into the peritoneum and excite a general peritonitis, or may take some other course—may open into the intestine, or come to the surface, or follow other directions. These cases are always dangerous and often speedily fatal. When the abscess opens externally, suppuration will usually continue for a length of time, and aside from other accidents may exhaust the patient.

When ulceration and rupture of the cæcum posterior to the peritoneum occurs, pain more or less severe will be experienced, tenderness in the part will increase, feverish symptoms will come on, a tumor will soon be felt deeper in the iliac fossa, and not unfrequently inflammation will extend to the peritoneum—almost necessarily if the rupture is through that part of the intestine covered by that membrane—the same as in perforation of the appendix, and similar severe symptoms will result.

When the inflammation extends from the unruptured intestine, or originates in the other causes which have been mentioned, the abscess is not so abrupt, and the symptoms are less violent. There will, however, be pain and tenderness, there is sometimes a chill, and generally more or less fever; but the approach may be very insidious, and the first symptom attracting attention may be the presence of a tumor. Constipation is apt to precede and accompany most of the cases.

A chill is more likely to mark the commencement of puerperal than other cases. The temperature, not notably increased in some, is from 100.5° to 102.5° F. in most cases, and rarely as high as 104.5° F. and above. The pulse will range from 80 or 90 to 120 in adults; the pain, though variable in intensity, is almost always present, and pressure increases it, and gives it a more cutting character. Sometimes it radiates from the point of the inflammation, and may be felt more severely at the epigastrium or elsewhere than at the seat of the disease. Nausea and vomiting are often present, and, as already stated, constipation is a common symptom. As the disease advances and a rupture of the formed abscess takes place into the intestine, pus may be found in the stools, the tumor decreasing; and if the quantity of the purulent discharge diminishes gradually hopeful indications are presented.

The most characteristic symptoms of an iliac phlegmon are the tumefaction with pain and tenderness. The swelling more gradually appears, the deeper the location of the abscess. When beneath the aponeurosis the swelling is less, not as distinctly defined, and comparatively immovable. When the phlegmon is due to adenitis, enlarged glands will generally be found in the folds of the groin.

When the psoas and iliac muscles are involved, movements of the thigh, particularly full extension, will be decidedly painful, and more or less pain may be produced by such motion from the disturbance of the inflamed part when the muscles are not themselves involved. Sometimes by pressure of the tumor upon the lymphatics and veins a local œdema is produced, and from pressure upon, or involvement of, the nerves severe lancinating pains may radiate toward the genital organs, and the groin of the affected side.

When the inflammation does not arise from rupture of the intestine or its appendix, resolution may often be induced by early and efficient treatment; but when it arises from that cause, or is neglected in the earlier stage, as is so likely to be the case in hospital patients, resolution is a rare event. Only two out of twelve cases observed by Grisolle, and but nine out of seventy-three other reported cases terminated thus favorably. In puerperal cases resolution is still more rare.

Suppuration and the formation of an abscess is the most common mode of termination, but the production of pus is often very slow, and may be delayed for two or three weeks, as the cellular tissue in which it occurs is not endowed with a high vital activity.

The suppuration is generally announced by more fever, often preceded by erratic chills, the temperature rising highest in the evening; the skin often becomes moist or covered with an abundant sweat, the local pain may become throbbing or lancinating, the tumor is enlarged and softer, and soon becomes fluctuating; at the same time evidences of nervous and vascular compression generally increase, and the constipation for the most part continues and may become more obstinate.

If the patient survives, the pus usually finds an outlet, but it is possible that a moderate quantity of pus may be absorbed and recovery follow.

The pus, as in the abscesses within the peritoneum, may take different courses. In the order of frequency it may be evacuated through the abdominal walls, especially if aided by timely surgical interference; it may appear below the crural arch, or pass up in the direction of the kidney, or toward the pelvis, though the last direction is rare except on the left side.

Perforation of the intestine is not very unfrequent, and it may occur at any time from two or three weeks to two or three months. Such perforation would be announced, as in the other cases, by a severe tearing pain, possibly at the time by diminished volume of the tumor and by purulent stools.

In women the abscess not unfrequently opens into the vagina, especially on the left side; it may enter the uterus, especially in puerperal phlegmon; or in still other cases it may empty into the bladder. Two cases of this kind have occurred under my observation, one puerperal and the other in a young woman; both lingered for a long time, with frequent attacks of severe pain and almost constant purulent discharges with the urine at micturition; both succumbed after a few years, one from the prolonged suffering and exhaustion, and the other from an acute inflammatory attack in her enfeebled condition. An old abscess with thick firm walls and a fistulous opening into the bladder was the pathological condition found post mortem. In the other no autopsy was made, but the symptoms were too unequivocal to admit of doubt.

In the case reported where the pus entered the vena cava, death followed immediately. In very rare instances it has ascended and perforated severally the diaphragm, the pleura, and the lungs, and in cases still rarer, the pericardium.

In cases where the abscess opens into the large intestine, recovery is usually the most rapid. Opened surgically through the abdominal walls, suppuration generally goes on for some weeks, and fistula and intestinal hernia may follow.

A termination by gangrene is rare except in the phlegmons consecutive to perforation of the cæcum or of its appendix. In such cases, if opened externally, there generally issues an ichorous, sanious liquid, mixed with gas and fæcal matter, and sometimes with shreds of dead tissue, almost always then followed by death. A less frequent termination is by phlebitis, with consecutive pyæmia, often with secondary abscess of the liver.

Diagnosis.—The diagnosis of iliac phlegmon is made by observing the history and phenomena which have been described. It is distinguished from *indolent tumefactions* in this region by the fever, pain, and tenderness; from iliac peritonitis by the more violent symptoms in the latter, and the different results of palpation in the two cases.

It may not be easy to distinguish it from inflammation of the cæcum itself—and inflammation of this part and its surroundings are often combined—but the tumefaction dependent upon fæcal accumulations will admit of indentation, and will be diminished or removed by the operation of a cathartic. Filling the intestine with a large enema of warm water will possibly enable it to be traced and distinguished from a swelling beneath it. It may be distinguished from a cold or passive secondary abscess from disease of the spine or the iliac bone, by the longer continued previous history of such cases.

A displaced, inflamed, or suppurating kidney might lead to a false diagnosis.

Inflammation and enlargement of a lymphatic gland in the region may with difficulty be distinguished from an iliac phlegmon. In adenitis, however, the tumor is developed without other symptoms such as commonly precede or accompany phlegmon; and if there be more than one tumor, they follow the course of the external iliac vessels. Some disease or injury in the course of the lymphatics below may cause adenitis, and when no other disease is present, there is usually little or no febrile reaction; and an inflammation of the glands generally, without other serious consequences, terminates in a cure.

A cancer of the cæcum or in the iliac fossa, an ovarian cyst, an inflamed uterine fibroid, or an abscess of the abdominal walls, might be mistaken for *peratyphlitis*, and require to be distinguished.

A phlegmon simply subperitoneal is to be distinguished from one subaponeurotic by the more defined and exact location of the former in the iliac fossa; and its more rapid progress; the latter is more deep, less prominent, and less definitely circumscribed.

Prognosis.—The prognosis of these affections in the cæcal regions, as the history already given indicates, is grave, but varies much with the particular form, the special location, and the course they may take, which cannot always be predicted. According to Grisolle, in seventy-three cases of phlegmon twenty deaths occurred; and of seventeen puerperal phlegmons seven proved fatal.

Evacuation through the abdominal walls, although the suppuration may be protracted, and accidents may occur, is, nevertheless, the most favorable mode; those which open internally are always uncertain and grave.

Treatment.—In perforation of the vermiform appendix or the cæcum, followed by extended and violent peritonitis, little else can be done or hoped for except to afford some palliation of the suffering by the administration of opiates and the application of fomentations. If the shock and depression are very great, ether or alcohol may be added to the opium, and two or three grains of quinine may also be given and repeated in two or three hours, or much larger doses may be given if the fever is high. A fatal result is to be expected, and cannot usually be long delayed.

Sometimes, although perforation occurs, adhesive inflammation has preceded, and the intestinal contents are prevented from being diffused into the peritoneal cavity. In such cases there is hope, and the same remedies—opium, quinine, and fomentations, with perfect rest—will be the means most likely to save the patient. Spanæmics, in all these cases, should be avoided, as the more plastic the inflammation the more likely will be the confinement of the pus to limited abscesses, and the greater the safety of the patient. A proper digestible diet should be given, fresh air allowed, and the most absolute quiet enjoined.

In ordinary cases of perityphlitis not produced by perforation, rest and quiet should be insisted upon, leeches should be applied according to the condition of the patient and the severity of the case; fomentations at first, and blisters afterward, should be applied; warm or tepid baths may be used; mild laxatives and enemas may be administered to overcome constipation; food must be prescribed which will leave the least residuum, and *the patient should be put upon free doses of morphine and quinine as antiphlogistic or anti-inflammatory agents.* The quinine, if not well borne by the stomach or the brain, should be suspended, or a single large dose may be given once in thirty-six or forty-eight hours; or the salicylate of soda in from one to three drachms, or even larger doses, may be given once in twenty-four or thirty-six hours, while a steady impression is kept up by the opiate. These means, with a repetition of the blisters, will not unfrequently prevent suppuration and cause the inflammation to terminate in resolution.

If, however, suppuration occurs, if fluctuation is felt, and the pus approaches the surface, the abscess should be opened, perhaps most safely by the aspirator—certainly so, if the matter be deep—though some have advised that in subperitoneal abscesses of longer standing than twelve days, and where there is no evidence of adhesion to the abdominal walls, the opening should be with caustics, as Vienna paste. Evacuating the matter by the aspirator is preferable, and may be done with comparative safety at an early period. Some have advised aspiration as soon as evidences of suppuration are presented. Prof. Willard Parker, of New York, reported a case as long ago as 1867, in which an opening was made down to the seat of the suppuration, even before fluctuation was discovered; and this plan has been employed by several surgeons since, with reported success. Results have been so favorable, that one enthusiastic writer on the subject states that this mode of treating these cases "may be said to have disarmed this disease of its terrors, and changed its issue from an almost invariably fatal result to the reverse."

Prof. Parker's operation consisted in making an incision over the tumor, dividing the skin and subjacent tendinous and muscular layers, until the fascia transversalis was exposed. Then, with an exploring needle or fine trocar, the pus was searched for, and, when found, a free opening was made; and after the discharge of matter a tent was introduced, and the wound was kept open for several days. Although such favorable results have been reported, it must not be supposed that such an operation, in the uncertainty of the precise location of the pus, is without danger; and the aspirator must be considered as safer, if it will answer the purpose of removing the matter and preventing the continuance and traveling of the abscess.

After suppuration has commenced, a tonic course—iron, quinine, and a nourishing diet—should be prescribed. Large fæcal accumulations should not be allowed to take place in the bowels, but the gentlest possible means should be used to overcome the constipation. Nothing more active than mild doses of salines or castor-oil, aided by emollient enemas, should, as a rule, be used.

When these abscesses find a deeper outlet, little can be done except to palliate symptoms, correct all other morbid conditions, and support the strength of the patient. This, however, may be much and should not be neglected.

These diseases about the cæcum, though not of very frequent occurrence, have so much pathological and practical interest, that they require the careful attention which has been given them here.

PERIPROCTITIS.

Periproctitis, or *inflammation* and *abscess* about the rectum, though coming within the province of surgery, requires a brief notice here. The disease has analogies with the inflammation about the cæcum, and may depend upon somewhat similar causes. Sometimes, though rarely, penetrating ulcers of the rectum occur, and consequent inflammation and abscess. It may be connected with hemorrhoids, constipation, or fissure. It sometimes originates in the tissue without depending upon other local disease in the region, and is frequent in tuberculosis. It also not unfrequently depends upon pus in the pelvis, and even in the abdomen, which has gravitated to this point. These abscesses may rupture through into the rectum, or point externally near the anus, discharging very offensive pus. They present the symptoms of pain—though this may not be great—tenderness, and swelling, and whether rupturing into the intestine or externally first, openings both into the intestine and externally are likely to take place, and fistulæ in ano to be established. This, however, does not always follow, and an early external opening is often followed by a speedy cure.

Treatment.—The treatment consists in keeping the bowels open by mild means—laxatives or enemas,—in the occasional application of leeches early, in the use of emollient poultices, and in the opening of the abscess as soon as the presence of pus is clearly ascertained.

The treatment of anal fistula requires surgical interference, and as the methods of procedure are described in all general works on surgery, they will be omitted here.

The physician, however, has not unfrequently occasion to decide as to the advisability of an operation in these cases, which is not always easy. In tuberculosis an anal fistula, by a derivative action, often relieves markedly some of the symptoms in the chest and throat; but when the discharge from the fistula is free, there is an additional source of exhaustion, and it becomes a question whether it shall be arrested. This will be referred to again, in considering phthisis pulmonalis.

DISEASES OF THE COLON AND RECTUM.

DYSENTERY.—"BLOODY FLUX."

The term *dysentery* is used to designate an inflammation of the colon and rectum, producing pain and straining at stool—tormina and tenesmus—with scanty, but mucous and bloody discharges, usually occurring frequently, but with little fæcal matter. These special symptoms are accompanied by more or less general prostration and fever.

These phenomena may be produced by a variety of causes, and may be associated with different conditions.

A simple intestinal catarrh, depending upon any of the causes mentioned when treating of that subject, when it involves the large intestines, and particularly the lower part of the colon and the rectum, will induce dysenteric symptoms. By the term "dysentery," however, as commonly used, something quite different from a simple recto-colitis, produced by irritating articles of food, drastic medicines, taking cold, or other accidental causes, is understood. As produced by less apparent causes, especially as occurring endemically or epidemically, it is a more distinct and specific disease, a general affection with special local manifestations, zymotic in its cause, and so similar in many essential respects to the class of specific fevers, that, in the classification of fevers, I have placed it among them.

The term dysentery, considered in its symptomatic signification, embraces two forms of disease, which may be termed *accidental* and *specific* dysentery.

1. ACCIDENTAL DYSENTERY.

Accidental dysentery is sporadic and non-infectious; is usually, though not always, of a comparatively mild character; is commonly more amenable to treatment in its acute form, and usually runs a shorter, and always a less specific course. It is dependent upon or produced by the common causes of muco-enteritis, and is a common non-specific catarrh of the lower bowels. Its more frequent particular causes are exposure to cold and moisture, improper articles of food, drastic medicines, irritating secretions, fæcal accumulations, calculi or foreign substances in the part, obstructed circulation through the liver, lungs, or heart, causing venous congestion. The local symptoms resemble those of the more specific forms of the disease, but they are less persistent, and the general disturbance and depression are not as great. The pathology agrees essentially with the ordinary forms of muco-enteritis, and need not be repeated.

Its course is very variable, depending upon its cause and severity; but in many cases it is mild, lasting but a few days, or even not more than a day or two, and will commonly subside readily when its causes are removed.

Treatment.—The treatment is essentially the same as that which has been described under the head of muco-enteritis or intestinal catarrh. The causal indications must be fulfilled. If irritating articles are in the alimentary canal, they should be removed by mild but efficient laxatives; if in the stomach, by an emetic of ipecac.; if the secretions are perverted, they should be corrected; if there be obstruction at the liver or the other organs, it should, if possible, be removed; if the disease arises from taking cold, perspiration should be induced; and in all cases, after proper evacuations, the irritated and inflamed intestine should be soothed. For this latter purpose, nothing is equal to the preparations of opium. A full dose of Dover's powder, or a quarter of a grain of morphine with a grain or two of ipecac., or an enema of warm water, followed by one with an aqueous solution of opium or morphine, etc., will often put an end to all the painful symptoms. These means should be repeated and continued according to circumstances.

A recto-colitis with dysenteric symptoms sometimes occurs in phthisis, bronchitis, pneumonia, malarial and other fevers, and in some other affections. In some of these cases the treatment of the dysenteric symptoms will be subordinate to that of the disease with which it is connected. When dysentery is complicated with malarial fever, the antimalarial remedies must not be delayed; and in pneumonia, the dysenteric symptoms, by producing a revulsion, sometimes appear to relieve the pulmonary inflammation. When the intestinal disease requires treatment, as it generally does, it must be conducted on general principles, but always with reference to the other conditions.

PROCTITIS.

A simple catarrhal inflammation of the rectum alone sometimes occurs, presenting symptoms essentially the same as those mentioned as belonging to recto-colitis. This disease may be acute or chronic, and more or less mild or severe. There is a sense of uneasiness in the rectum, or of burning irritation, a disposition to go to stool, when there is much straining, and the passage of mucus, but without complete relief, there being a sensation of something remaining, and the patient returns again and again to the close-stool, passing chiefly mucus and blood. This condition, called tenesmus, is particularly annoying and depressing. The sphincter ani is in a state of spasm, the pain radiates to the hips and back, and a sense of nausea and decided prostration is often felt.

In severe cases the suffering is very great, the straining at stool is severe and constant, and sometimes results in a prolapsus of the rectum, which, grasped by the sphincter, presents an intensely congested and often very dark appearance. The neighboring organs sympathize, strangury is very likely to occur, and in females the menstrual flow, or more properly a uterine hemorrhage, may come on. The inflammation is likely to extend to the colon, the more so as fæcal matter is often retained and accumulates in that viscus, and recto-colitis, or simple non-specific dysentery results. Inflammation may extend, though this is rare, to the peritoneum, with serious consequences following.

Etiology.—Besides the causes referred to as producing recto-colitis, displacement of the uterus in females and enlargement of the prostate gland in males, and hemorrhoidal tumors in either, may excite this form of disease.

In ordinary milder cases the disease tends to recovery in a few days, but in the severer cases it may be more protracted, and periproctitis, and more rarely peritonitis, may follow. In the protracted cases, ulceration is likely to follow, the hemorrhoidal veins often become varicose, emboli may form, the liver may become secondarily affected, and severe, protracted, or fatal results may supervene.

Diagnosis.—A complete diagnosis will often require a careful exploration of the parts, and the exclusion of other conditions.

Prognosis.—The prognosis is generally favorable unless there is a dyscrasia, as tuberculosis, with which it is sometimes associated.

Treatment.—The treatment of acute cases is essentially that which has been mentioned as applicable to recto-colitis. It would be a mistake to resort to astringents, or even opiates, with a view of arresting the discharges, until free evacuations have been procured, for which purpose saline laxatives, often preceded by a mild mercurial, should be used. Soothing measures will then be required. Fæcal matters should not be allowed to accumulate and become hard, and consequently irritating when passing; but the bowels should be kept soluble by mild saline laxatives, or by castor-oil.

In the chronic and ulcerative cases, local treatment will be required, and will be more fully described under the head of chronic dysentery. In the cachectic cases, in tuberculosis, the remedies adapted to that condition are demanded.

2. SPECIFIC DYSENTERY.

This form of the disease is by far the most frequent, and is the one generally understood when the term dysentery is used. It is a peculiar febrile and inflammatory affection, generally regarded as zymotic, or depending upon a poison; and is defined substantially by Jaccoud as "an ulcero-membranous, transmissible recto-colitis, characterized by tenesmus, griping, and repeated discharges of muco-sanguinolent matter, and a general state more or less grave."

It may be either sporadic, endemic, or epidemic in its occurrence, and its severity varies much in individual cases, and in the general character of different endemics and epidemics. The sporadic cases, as a rule, are less severe than the others, though some endemics are very mild and others are exceedingly severe and fatal, while the more widespread epidemics are generally grave.

It is not easy, or perhaps possible, to distinguish some specific cases which occur sporadically from accidental or non-specific recto-colitis, though a difference in cause at least exists. The common causes of the non-specific disease may, however, determine an attack of the specific, and it is possible the former may pass into the latter.

Etiology.—Sporadic cases may attack any age or sex, and the disease has its maximum of frequency at the close of the summer season, when cold evenings and nights succeed the heat of the day. Various particular conditions favor the development of dysentery. They may be stated as some cosmic influences which we do not understand; lying on moist ground without proper protection, especially in the night; the arrest of transpiration by cold and moisture, in any situation; direct irritation of the membrane, as from improper food and drink, from unripe fruits, iced drinks, etc. In Asiatic cholera, when a general tendency to the disease prevails, special irritating causes may precipitate an attack; so when a dysenteric zymosis is present but in moderate amount, these coöperating causes may be necessary to produce the disease in individual instances. This principle applies not only to the sporadic but to the endemic and epidemic forms as well.

The unknown cosmic causes, or the presence of a specific dysenteric poison, may become constant in a locality, causing the disease there to be endemic. When such influence or poison is in large quantity, and affects large numbers, the disease becomes epidemic.

The nature of the influences essential to the production of endemic and epidemic dysentery has given rise to much discussion, and involves the same questions which present themselves in all forms of specific zymotic diseases. The doctrine of special poisons is constantly gaining ground. Specific facts in regard to the cause of some diseases have been established, and thus the analogies of others have left but little doubt of the existence of peculiar organic poisons and their agency in the production of most endemic and epidemic diseases. Certain telluric conditions favor the production of peculiar poisons, and animal and vegetable decompositions seem to contribute to the same end; at least decomposing changes, either as causes or effects, are associated with such poisons or influences, and produce different peculiar diseases. Dysentery is one of this class.

The specific cause of dysentery frequently coincides with that of paludal or malarial fevers; but this is by no means always the case, and some of the most severe endemics or local epidemics of dysentery have prevailed where malarial fevers are unknown. In other instances the dysenteric influence has seemed to have intimate relations with the typhus poison. A number of cases of dysentery collected together has often appeared to develop typhus fever.

Certain *practical* facts respecting the genesis of dysentery seem sufficiently established. Organic and, particularly, animal matters in a state of decomposition, together with certain climatic influences, produce the disease; but by what particular process is not known.

The spread of the disease is favored by crowding, insufficient food, and excessive fatigue.

In the countries particularly subject to it—in the hot regions, where it is endemic—these unfavorable hygienic influences, aided by the climate, produce the epidemic variety which so often spreads destruction and desolation in armies, fleets, and cities.

The disease in this epidemic form usually first attacks the individuals exposed to bad hygienic influences, and then others who come within the influence of what appears to be the poison, which many regard as being multiplied by the prevalence of the disease.

Whether the poison is actually multiplied in the bodies of the sick, as is evidently the case in small-pox, scarlet fever, and other strictly contagious diseases, is not positively determined; but that it is not exhausted or destroyed in the body of the patient is presumed; and many believe that it exists in the excretions, and that the dysenteric discharges are capable of communicating the affection to others.

It varies greatly in severity in different epidemics, general or more local, and when prevailing over a large region it is often much more severe in some localities than in others, even when such localities are but a few miles, or, in some cases, in cities, but a few streets apart, and the general conditions of the patients seem to be the same.

Independent of crowding, epidemic dysentery often appears in villages, or in sparsely settled farming neighborhoods, where there are no special appreciable hygienic conditions different from those that exist in other localities free from the disease; but in such cases the severe local prevalence is generally preceded by sporadic cases, the disease gradually increasing in the number of attacks and in the severity of the individual cases.

It is generally stated by authors that dysentery occurs oftener in moist hot weather, and this may be true as a general fact; but within my observation, in the rural districts of the West, it has appeared as a local epidemic, in several instances with the greatest severity, in hot and *dry* seasons and places.

Not only does it differ in severity in different places when there is a general prevalence of the disease, but it differs in its type and in respect to particular symptoms in the different localities. For example, some years ago, when the disease was prevailing quite generally over a large region in Western Massachusetts, nearly all the cases in a particular neighborhood were attended with decided, and often very profuse, hemorrhage from the bowels; while that peculiarity did not exist in other neighborhoods but a few miles distant. This is not a solitary instance of such particular deviations from the ordinary type generally prevailing. Facts of this kind tend to show that a special poison or influence is operative in producing the disease, and that it is more intense or of a more active character in some localities than in others.

The question of *contagion* in this, as in some other diseases, is not easy to decide. The difficulty depends partly upon the particular signification given to the term, and partly upon the complicated character of the facts. If by a contagious disease is meant one produced by a poison generated in the body of the person affected with the disease, and communicated to others, producing the same affection, which is ordinarily produced in no other way, there is no sufficient proof that dysentery is contagious; indeed there is abundant proof that it is not. But if by contagion is meant the transmission of a disease from a sick person to a healthy one by a product emanating from the sick person, whether generated or multiplied in the body, or merely passing through it, and if it is admitted in this definition that the disease is often produced in other ways, then it is possible, and even probable, that dysentery is contagious, and that the contagion is in the alvine discharges, and consists of low forms of organisms. This subject, as well as others of a similar character, awaits further elucidation. How far, and in exactly what respects, sporadic and even accidental dysenteries differ from endemic and epidemic forms of the disease has not yet been determined. Unlike the diseases most clearly and characteristically contagious, one attack of dysentery, so far from conferring immunity from a future one, rather predisposes to a recurrence.

PATHOLOGICAL ANATOMY.

The structural changes properly belonging to the disease occupy the large intestines, and are usually most intense in the region of the sigmoid flexure of the colon. Their chief seat is in the minute glands of the mucous membrane and the (intervening) intertubular connective tissue. Diseased conditions, especially in scorbutic cases, may extend to the small intestines.

There are not unfrequently complicated cases, and secondary lesions are often found. Dysentery may be complicated with typhoid and typhus, and often with malarial fevers; with congestion and obstruction of the liver, especially in hot climates and seasons, and in malarial regions; with scorbutus, as in our late army experience; with tuberculous and syphilitic conditions; and, as I observed in many cases in Chicago, with epidemic cholera—dysentery often following attacks of that disease. As secondary lesions we have abscess of the liver from absorption of pus or septic matter, or the formation of emboli carried to that organ; disease of the mesocolic glands; perirectal and pericolic inflammation and abscesses; peritonitis, sometimes from ulceration and rupture; and contraction and obstruction of the intestines from the contraction of cicatrices after ulceration.

The special intestinal lesions, during the progress of the disease, are:

1st. Hyperæmia and exudations of mucus and blood, involving the mucous surface of the colon and rectum, the hyperæmia being more intense near the follicles.

2d. Inflammation in the tubular follicles.

3d. Inflammation in the solitary vesicles.

4th. The tissue is infiltrated with a sero-sanguinolent material, which is most abundant in the submucous tissue, but may extend to the cellular and muscular coats; the mucous surface is denuded of its epithelium, while in some cases an exudate is poured out upon the surface, which tends to a sort of organization and the formation of a false membrane.

5th. In the more severe and protracted cases, suppuration and ulcerations appear; destruction occurs at points in the false membrane and the proper tissues, involving the mucous membrane and its glands; and in scorbutic cases the ulceration extends often to the small intestines.

6th. Sometimes casts of the intestines are formed from the false membrane, and are occasionally thrown off in larger or smaller tubes, segments, or patches.

7th. In the severest cases, ecchymoses, extended suppurations, and sloughs of the general tissue occur, and a dark and ragged disorganization results.

The ulcerations, which seldom take place before the end of the second week, have different modes of production.

They may arise from suppuration of the follicles, or from compression of the vessels by the interstitial exudate, which destroys nutrition in points and causes necrosis. In the latter case, the exudate and the necrosed point will be thrown off together, and the ulcerated borders are irregular; while in the suppuration of the follicles, the small resulting ulcers are more regular. In either form the ulcer may spread and penetrate all the coats of the intestine and induce peritonitis. In other cases, or in studying the ulcerative process more minutely, it will be found that in the process of ulceration there will be:

1st. Intumescence and softening of the solitary glands, and a breaking down of their structure by one or other of the processes before named, resulting in small ulcers.

2d. The ulcers spread, and groups of these glands, with intervening tissue, become destroyed, and erosions are left.

3d. There will be submucous inflammation and effusion, causing deeper ulcerations.

4th. Intertubular inflammation, and inflammation at the base of the glands occur, followed by ulcerative processes.

5th. Submucous abscesses sometimes form, and possibly rupture into veins, but oftener they make their way through the mucous membrane, and the pus is discharged with the mucus, blood, and fæces, leaving an ulcer in the place of the abscess.

6th. When a croupous exudate, which may be poured out during these processes, is sufficiently organized, it may undergo an ulcerative process.

When ulcerations of the intestines occur, the disease lingers and may become chronic.

In chronic cases, atrophic and contracted conditions of the intestines involved often result, the cicatricial contractions, after extensive ulcerations, often become permanent, impairing perpetually their functions.

Lesions of Peyer's glands and of the mesenteric glands sometimes take place, and generally atrophy of the glandular parts of the intestinal canal; lesions of the serous membranes and of solid organs, not only of the abdomen, but of the thorax, from pyæmia or embolism, may follow and seriously complicate dysentery.

Complications of disease of the liver are frequent, especially in hot climates and malarious regions; the liver disease, by obstructing portal circulation, sometimes becomes a cause, and at other times, by pyæmia or embolism, occurs as an effect of dysentery.

Statements respecting conditions of the blood in this disease vary widely, and it is to be presumed, therefore, that its state differs in different cases.

As has already been intimated, there are various types of dysentery, dependent upon its different degrees of severity and its time of continuance, and the different lesions as well as symptomatic phenomena presenting themselves.

The difference between the accidental or non-specific cases and the more specific forms of the disease has been discussed.

There are different general types of the specific disease. Besides the anatomical and particular local symptomatic peculiarities, the cases may be divided into two classes as regards the general condition and activity of the system, viz.: 1. Acute inflammatory or sthenic forms, where there is no special depression; and, 2. Asthenic, adynamic, or typhoidal forms, where there is special depression of the vital powers and actions, the cases tending to malignancy. This last class seldom occurs except when the disease prevails as an epidemic, though in some limited localities very malignant cases sometimes appear. Between these there are numberless gradations, which it is impossible to specify.

SYMPTOMATIC PHENOMENA.

The symptoms or external phenomena of the disease next require attention. In some cases the onset is without marked prodroma, the pain, tenesmus, and slimy discharges suddenly appearing, in mild cases, without chills, and with almost no fever.

In cases of medium intensity the dysenteric symptoms are often preceded by what is apparently an ordinary intestinal catarrh. There is general malaise, lassitude, chills, and fever. This prodromic period may last from a few hours to two days. In a severe epidemic variety the attack is generally sudden, though it may be preceded by general symptoms. In some adynamic cases the depression is great from the beginning, the extremities and much of the surface are cold, and no external fever, in cases lasting but two or three days, is observed. Usually, however, if the disease continues on, there is fever, generally quite markedly remitting, with evening exacerbations.

In well-developed and established dysentery there is pain in the abdomen, increased on pressure, and generally greatest on the left side, near the brim of the pelvis. There is a sense of pressure or fullness, as of a foreign body in the rectum, where the tactile or common sensibility is greater than in other parts of the intestinal canal, causing repeated efforts at defecation.

The evacuations, often fæcal at first (as such matters may be in the lower bowels), or simply loose and catarrhal, soon become nearly or entirely mucous, with, or sometimes without, mingling of blood. Sometimes the matter resembles "frog's spawn," or a liquid containing grains of sago. By the second or third day, if not before, the stools usually become bloody, and the thick mucus and blood intimately mingled sometimes give them the appearance of pounded flesh. In the milder cases, after some discharge of mucus tinged with blood, and bearing epithelial débris, continuing from one to three days, the discharges may spontaneously cease, and the patient soon recover.

In the severer cases, however, the blood in the stools is apt to increase, and membranous fragments may often be seen. When the follicles are attacked, the mucus is likely to be more solid, and its unmingled portions transparent. If fæcal matters have not passed off, they are apt to form rounded, hard, or scybalous masses, and these occasionally appear in the stools. Their formation, retention, and passage may be an additional source of irritation.

While the discharges are nearly pure mucus, or mucus with fresh blood, they may be almost odorless; but later, especially in hot climates, the fæcal matters may become more abundant, assuming a darker color, and containing solid débris and bilious and other excretions, partly liquid, and sometimes very offensive. This offensiveness may be the result of gangrene, and is, of course, a grave symptom.

The frequency of stools is variable. These may, in milder cases, be not more than ten or twelve a day, while in other and the more severe cases, they may be exceedingly numerous, the patient with difficulty being kept from rising every few minutes, or remaining almost constantly at stool.

From the proximity of the rectum and bladder, the latter organ often sympathizes, and there is sometimes extreme vesical tenesmus and strangury, and not very unfrequently, especially in men past middle life, there is entire inability to pass urine. Irritation about the anal region, in children particularly, is apt to be decided, and eversion of the mucous surface, and even prolapsus of the intestine from the repeated straining sometimes occur.

As to the more general symptoms, the weakness is usually marked, the features contracted and expressive of severe suffering; the tongue is variable, but generally coated; and the abdomen is usually contracted. In the severer cases, continuing for from one to three weeks, the fever is generally decided and may be severe; the skin is usually dry, though it may occasionally be moist; the thirst is often great, and in the more typhoidal forms the pulse becomes feeble; the tongue is dry and dark, sordes accumulate upon the teeth and gums; the eyes are much sunken, and the whole expression is that of great prostration.

In some cases there are severe nervous disorders, delirium, subsultus tendinum, general trembling, and in children, not very rarely, convulsions. These symptoms are sympathetic and reflex, and not dependent on structural lesions of the brain. The mind usually remains intact.

Vomiting early in the disease and at more advanced periods not unfrequently occurs, sometimes the result of reflex irritation, at other times in consequence of gastric catarrh, and in still other cases from a profuse and regurgitating bilious secretion. In the latter case the vomited material is yellow, or dark and bitter, and its ejection often affords relief. When the matter vomited is a colorless fluid, when there is no gastric pain or tenderness, and the tongue is not red, the vomiting is reflex and is not of serious significance.

Course and Prognosis.—The continuance of dysentery is very variable. Mild cases may last but a short time—from two or three days to one week. Very severe and malignant cases may also have a short course, soon terminating in collapse and death. Most cases continue from one to two, or perhaps three weeks—not a few longer—and some become chronic with ulcerations and other severe lesions, to which the patient finally succumbs; while still others more or less perfectly recover after a long continuance of the disease.

In the sporadic form it seldom terminates fatally, and even in ordinary epidemics in temperate latitudes a large proportion of cases recover. In exceptional epidemics, and especially with children, the mortality is very great. Some of the more unfavorable symptoms are unusual depression, briny or very offensive discharges, involuntary evacuations, very great and extended tenderness, delirium, coma or convulsions, any evidence of sloughing, or of markedly typhoidal symptoms.

The particular causes of death are various, and this consideration may aid in the prognosis and afford indications of treatment.

Death in the early stages is usually caused by the severity of the inflammatory and febrile shock; by the blood poisoning often present; by the sloughing of the intestines which sometimes occurs; and by the exhaustion from the pain and the discharges. In the more protracted cases the patient may be worn out by the continued suffering and discharges, and the want of proper nutrition.

The accidents which may cause death, but which occur only in a small proportion of cases, are perforation of the intestines from ulceration, gradual exhaustion from the destruction of the intestinal membrane, contraction of cicatrices after ulceration, and consequent obstruction of the bowels; and the very serious accident of pyæmia or septicæmia, from the absorption of pus and septic matters, and the formation of emboli. These emboli are produced by inflammation and ulceration, which invade the intestinal veins and cause serious blood poisoning, and this results in secondary inflammation and suppurations in the mesentery, liver, lungs, or elsewhere.

Catarrhal diarrhœa sometimes follows dysentery, and relapses are liable to occur and to be grave. Death may result from free intestinal hemorrhage, though this is rare, and occasionally from peritonitis without perforation.

As sequelæ, in addition to occlusion, abscess of the liver, and other results already mentioned, perityphlitis and periproctitis, paralysis of the sphincter ani and other muscles, and a general marasmus may occur.

The dysenteries of warm countries, and of hot seasons in malarious regions, have some peculiarities. The disease, as a rule, is more violent; its progress is marked by greater periodicity of the fever; there are more frequent relapses, and serious complications of disease of the liver—congestions, phlegmonous and catarrhal inflammations, and jaundice; and diseases of the spleen are more likely to take place. In such localities the disease is also more likely to pass into a chronic state.

Chronic Dysentery requires notice. Dysentery is more likely to pass into the chronic form where the intestines have been frequently attacked, and the patients have thus been exhausted. Defective hygienic conditions and a want of proper treatment and care are the most frequent causes of the chronic form. In some epidemics, however, such lesions so early take place as to induce in a modified form the continuance of the disease.

Where an acute attack assumes the chronic form, after three or four weeks there is a mitigation of the symptoms; the evacuations are less frequent, but they persist; they may become fetid, are often of a yellowish color, are very slightly bloody; the pain and tenesmus cease or become very slight; there is generally a voracious appetite, but emaciation continues; the eyes, instead of regaining, continue to lose their expression; the voice becomes husky, broken, and high-pitched; the tongue, often smooth, glazed, or fissured; the skin, inelastic and wrinkled; the abdomen flattened; and death not unfrequently follows from exhaustion, or from a sudden occurrence of an acute attack. Its duration is from some months to two or three years; and, when it is once fully established with the dysenteric cachexia, it is exceedingly difficult to manage, and in many cases it resists all treatment, and death results. Ulcerations and other disorganized conditions of the intestines, and such a depraved condition of the general system have occurred as to render death in some cases only a question of time.

Diagnosis.—The *diagnosis* of dysentery is not usually difficult; the entire symptoms taken together will make the case plain. It is distinguished from diarrhœa by the character, the small quantity, and the difficulty of the discharges in dysentery, and by the absence of fever in simple diarrhœa. It is distinguished from hemorrhage by the absence of mucus in the discharges, and of tenesmus in hemorrhage. From hemorrhoids or fissure, together with diarrhœa, by the absence of the febrile symptoms, by the history of the case, and by an examination which will demonstrate the presence of these local affections. It is distinguished from typhoid fever with intestinal hemorrhage, by the peculiar characteristics of typhoid, by the free liquid discharges, by the tympanitic abdomen and the absence of mucus in the evacuations, and an absence also of the tenesmus and other special evidences of dysentery.

TREATMENT.

The authority of the profession in regard to the treatment of acute dysentery is far from being uniform. This will not be so surprising when the different forms which the disease may assume are taken into the account, as well as the different surrounding influences and general conditions of patients, the complications which may exist, and the different stages of the disease in which the treatment is applied.

In reference to treatment, the causes, the general tendency of the disease, the particular vital power of the patient, and the different stages or degrees of the anatomical changes going on, must all be considered.

In the first stage or degree of the disease the mucous membrane is hyperæmic, œdematous, and thickened, and the secretion from face is changed but scanty. There is soon, however, a freer secretion of mucus and blood, with corpuscular, and sometimes organizable or diphtheritic exudate, and destruction of the epithelium of the membrane. In the third degree of change there is ulceration, suppuration, more infiltration, and sometimes submucous abscesses; and in the fourth, or more severe degree of the disease, there is sloughing of the inflamed membrane.

Besides the other complications—morbid conditions especially of the liver and other organs—which have been mentioned, the mesocolon and mesentery, with their glands, are generally hyperæmic and sometimes suppurating. The existence of one or another of these various conditions must modify treatment, and a uniform plan for all forms and stages of the disease cannot be laid down.

In the first place, the cause, if it can be recognized, must be taken into account. The "natural history" of the disease should be considered, and it should be remembered that in a large majority of sporadic cases of moderate intensity, with rest and proper diet, etc., the disease will spontaneously terminate in a few days by self-limitation.

When dysentery is prevailing, prophylactic measures should not be neglected. Every source of putrescence should be removed or avoided; care should be taken of the diet and exposure; and it will certainly be safer to isolate the sick as much as possible, to secure free ventilation, to disinfect the stools, the linen, and other articles used about the patient, to practice the greatest cleanliness, and to observe all the rules suggested in the case of typhoid fever and other diseases where there is reason to suspect infection.

In the mild variety, especially if free fæcal evacuations have preceded, rest in the horizontal position, a warm bath, or sponging of the surface with warm water, to which is added a little soap or alkali, proper clothing, with a very plain, simple, unirritating diet which will leave but little residuum, taken in moderate quantity—such as scalded milk with a small quantity of thoroughly cooked farinaceous material, as corn-starch, tapioca, rice, farina, etc.—and demulcent drinks may be all that will be required.

If fæcal matters to any extent are supposed to be in the intestines, mild laxatives or enemas to secure their removal are certainly indicated.

A dose of castor-oil, with five or eight drops of laudanum or some spirits of camphor (the laudanum in small doses in such cases will not interfere with the operation of the oil), to be repeated if necessary, will answer the indication. If the pain and irritation be considerable after this, a dose of morphine, a Dover's powder, or some other opiate, or an enema of starch and laudanum, or of an aqueous solution of an opiate, repeated as may be required, will certainly relieve the suffering, and, in my judgment, will tend to allay the inflammation and cut short the disease.

The more difficult questions as to treatment do not pertain to these milder cases. Under the simplest measures here, or without any medication at all, the cases will terminate favorably, and various remedies have undoubtedly obtained a reputation as cures which they do not deserve.

But medicines are capable of modifying the disease, and in the severer cases they may be very important. As already intimated, various methods have been strongly advised by different authors, and some of them have been almost as strongly disapproved of by others. Among these methods may be mentioned: (1) Active "antiphlogistics"—evacuants, free abstraction of blood either by venesection or leeches; (2) large and repeated doses of calomel with frequent saline purgatives, and even contra-stimulant doses of tartarized antimony; (3) laxatives to secure fæcal, liquid, or diarrhœal discharges, and then opium, keeping the bowels at rest as long as possible until the dysenteric discharges reappear, when the cathartic is to be repeated, to be followed in turn by opium; (4) the persistent use of moderate doses of cathartic salines; (5) the repeated and continuous use of castor-oil, with other bland oily emulsions; (6) free and continuous doses of opium; (7) large doses of ipecacuanha, some desiring to secure its emetic effect in the early stage; others trying to avoid the emetic operation, depending on a somewhat specific action to control the disease; and (8) the repeated use of cold water enemas, with the internal use of a non-purgative saline, as the nitrate of potash.

Any of these methods may have their advantages in particular cases, but none of them can with propriety be exclusively pursued in all forms and stages of the disease. Remedies, in order to their best effects, must be adapted to the special condition of the cases treated. All of the conditions, to many of which we have referred, must be carefully considered. There are, however, some particular medicines which in most cases are applicable, and there are certain somewhat uniform courses of treatment which will be best for the average cases of the disease as it occurs in particular localities and in particular seasons, and some of these will be presented.

The depleting treatment with free blood-letting can be applicable only in sthenic forms of the disease and in plethoric subjects. In such patients, when the inflammation is acute and the fever high, a venesection, or a good number of leeches applied to the more tender parts of the abdomen, or near the anus, will sometimes afford marked relief, and where blood in the system is abundant, these measures can hardly be followed by any unpleasant effects. They will often be well borne at any time before much exhaustion has occurred. Bleeding, however, is seldom required, and is useful only in exceptional cases.

Large and repeated doses of calomel are unnecessary, and in many cases would be very injurious and dangerous. In robust unsusceptible patients with "bilious" complications, a few decided doses, followed if need be, and as a rule, by a saline laxative or cathartic, may be of marked benefit; and in hot climates and seasons, and in malarial districts especially, a few smaller doses of some mercurial, followed generally by laxatives, experience has proved to be useful. The mercurial modifies favorably the secretions and conditions of the stomach and bowels, favors the discharge of bile, and tends to unload the so often congested liver, and to relieve the portal circulation so often obstructed. The influence of portal congestion upon hyperæmia and inflammation of the abdominal viscera is well known. In anæmic, delicate, and impressible patients mercury must be used with great caution and in smaller doses, but with the proper precautions it may be as useful with them as with others.

Saline purgatives and laxatives have their decided uses. In connection with mercurials, as just mentioned, and often by themselves, by increasing the watery secretion from the hyperæmic mucous membrane, they unload its vessels, and often procure more relief in this way than they cause irritation by their specific exciting effect. They operate to a large extent by endosmosis, and not unfrequently produce no perceptible irritation; but their too frequent and excessive use may irritate, weaken, and depress too much, and they must be prescribed with great care and discretion. The authority of Bretonneau and Trousseau is quoted in favor of free doses of saline cathartics, but not as exclusive remedies in the disease. Trousseau, however, in his zeal for evacuants, condemns any considerable use of opium. Dr. Woodward, in the Army Medical Report, relies much on saline purgatives, regarding sulphate of soda as the best. Early given, he says, they evacuate the intestines, increase secretion, and relieve portal congestion. He condemns astringents in the active stages and uses opium sparingly. Jaccoud likewise advises caution in the use of opium.

Dr. Bartholow also regards saline evacuants as of the first importance in the early stages of the disease, before the mucous membrane has begun the process of denudation, and prefers sulphate of magnesia acidulated with dilute sulphuric acid. He says, "it serves a triple purpose; it empties the canal of retained fæces; it lessens hyperæmia by setting up an outward osmotic flow; and its after effect is astringent and sedative."

Tartar emetic, in any quantity sufficient to exert an antiphlogistic effect, would be so sure to irritate the mucous surface that its use should be discarded.

The method of giving laxatives or cathartics to secure fæcal and liquid discharges, then opium to keep the bowels as long as possible at rest, and then laxatives and opium to be repeated, and so on during the active stage of the disease, has been praised by some; and in vigorous and unsusceptible patients may, for a time at least, be borne with advantage. But the frequent repetition of the cathartics is, in most cases, too irritating and debilitating, and as a general and indiscriminate practice cannot be advised.

The continued use of small doses of laxative salines, as a drachm of sulphate of soda or phosphate of soda, or Rochelle salts, repeated once in four hours, called the "saline" treatment, has its advocates, and in sthenic cases may be proper, if other means are used at the same time; but as an exclusive or constant method I cannot advise it.

The repeated and continued use of larger or smaller doses of castor oil in nearly all stages of the disease, with other oily emulsions, is advocated by some with great earnestness. Dr. Pantaleoni, of Rome, one of the most prominent physicians in Italy, strongly advises this course, and claims almost uniform success in the treatment of dysentery as it occurs in that city, both among the natives and the foreign visitors. He gives it in doses sufficient to evacuate the bowels, and then in smaller quantities of a drachm or so, once in a few hours, giving occasionally freer doses when a cathartic effect is required. The discharges, it is alleged, are notably checked, even in the advanced stages, by this treatment. Others have advocated the same or a similar plan, but my own observation of the effects has not been sufficient to enable me to express a decided opinion. The late Dr. Z. Pitcher, of Detroit, well known to the profession, often used in his practice small (one or two tea-spoonfuls) and repeated doses of olive-oil, frequently combined with small doses of laudanum.

The use of free and repeated doses of opium has many advocates, and few practitioners would treat a severe case of dysentery throughout, without the aid of this important drug. There are those, however, of high authority, as we have seen, who condemn its general use, contending that the intestinal discharges should rather be promoted than checked; and that though it procures temporary relief from pain, patients do better without it. These views are certainly worthy of being considered, and the effects of this article may be too much relied upon. Every physician of much experience has found that it sometimes fails to procure relief from the tenesmus and frequent discharges, while it often tends to produce the retention of urine, so common in some cases, and sometimes to seriously disturb the nervous system.

But after proper evacuations, and interspersed with other agents so that the secretions from the intestines and liver are not too much checked, it often affords, in proper doses, great relief to the suffering; and dysenteric inflammation does not so much differ from other inflammations of the intestines that opium, acknowledged to be so useful in the latter in abating inflammatory action, is incapable of doing so in the former. It has its place, and an important one, as I believe, in the treatment of dysentery, and the interests of patients will not allow it to be entirely set aside in this disease.

Ipecacuanha is another remedy about which there are differences of opinion as to its use in dysentery. It first obtained its introduction into practice about two hundred years ago, as a remedy in this affection, and after nearly losing its reputation as an antidysenteric remedy for a long period, it has now regained it, and has been extravagantly praised of late by some when given in very large doses. It is said to be very extensively used in the severe dysenteries of India, and that since its general introduction the mortality in this disease has been reduced from 79.6 per one thousand cases, to 20.15 per one thousand. It should be understood that statistics of this kind respecting the use of any single medicine or method of treatment are not to be fully relied upon in determining its value. Diseases differ greatly in their severity at different times; and often changes in hygienic conditions, or in various items of treatment, are introduced at the same time. However, the testimony in favor of ipecac. in dysentery is sufficient to demand for it careful investigation. Dr. Maclean, of the British army in India, gives from twenty-five to thirty grains at a single dose, in a small quantity of fluid, such as the syrup of orange peel, though perhaps it is better given in a wafer or capsule. He enjoins perfect quiet, and allows no drinks for three or four hours, with the view of preventing vomiting. In from eight to ten hours it is given again in doses of from ten to fifteen grains, repeated, if necessary, for days, until the symptoms are much improved. Others advise smaller doses repeated oftener, but so as, if possible, to prevent vomiting; while others still give it so as to induce vomiting at first, but endeavor by opiates, mustard to the epigastrium, and the withholding of much drink, to establish a tolerance afterward. Others give from thirty to sixty grains every four or five hours, and by opiates, etc., endeavor to prevent emesis. Dr. Bartholow mentions the following powder, to be taken at once: ℞ Ipecac., ʒss; Opium, gr.j; Pulv. Aromat., gr.v. M.—A sinapism is to be applied to the epigastrium, and an enema of starch and laudanum, or a hypodermic injection of morphine, is to be given. He has used fifteen-grain doses in milk, and found it often well borne; but says that not unfrequently tolerance cannot be established, and that the remedy must be abandoned. Jaccoud says the ancient Brazilian method of giving the medicine is the best. Make an infusion of from ʒss to ʒij of ipecac. in from ℥vjss to ℥x of water. This liquid is to be taken in appropriate free doses once or twice during the day, and continued for several days. In consequence of the nausea ipecacuanha produces, patients are often with difficulty persuaded to take it; and its specific virtues in the disease are doubted by many, and by some denied.

Dr. Woodward, in the United States Army Medical Report, advises it in the early stages of some cases of dysentery as an emetic, but doubts its specific effects in the disease. On the contrary, according to Dr. Flint (Clin. Med., p. 284), Dr. A. A. Woodhall, of the army, shows "conclusively that it is entitled to be called an abortive remedy." Evidence on either side might be much further quoted, but without coming to positive conclusions as to the amount of benefit the remedy may afford.

There can, however, be little doubt that in some cases of dysentery, ipecac., in free doses, produces decidedly favorable effects, especially in the dysenteries of hot climates, often causing a change in the character of the evacuations, producing what are called "ipecac. stools," abating the fever, and allaying the inflammation. It is, therefore, worthy of further trial; and it is to be hoped that the cases to which it is best adapted will ere long be determined. Judging from the known physiological effects of the article and its therapeutical action in other diseases, we should conclude it to be best adapted to strong and vigorous patients, not too far reduced by the disease, free from gastric irritation, and not sensitive to nauseant remedies. With such it may be tried; but I should be reluctant to persist long in its use where it did not seem to be well borne, or where it produced much depression.

The treatment with repeated cold water enemas may be adapted to some cases, the water by its direct local effect diminishing the hyperæmia and the inflammation of the intestines. Enemas, however, will frequently not be retained, especially in quantities sufficient to apply to any considerable portion of the intestine, and their frequent repetition becomes not unfrequently a source of irritation. When there is much gastric, duodenal, and enteric irritation, nitrate of potash could scarcely fail of increasing this condition. Great care should be exercised in the mode of administering enemas. A soft, elastic tube will be found least irritating; and if the patient be placed in the "knee and elbow," or, better, in the "knee and chest" position, a soft tube may be introduced into the colon, and the inflamed intestine irrigated often with benefit.

How, then, shall the ordinary cases of summer and autumn dysentery in our climate be treated? My personal observation has been chiefly in the North-west—Southern Michigan, Chicago, and Northern Illinois—but it has extended to New England, and to the army of the Potomac in Virginia during our late civil war. These observations have continued many years, and embraced a large number of cases. The course my experience leads me to advise is as follows: When the disease commences in the ordinary manner of decided attacks, with the symptoms which have been sufficiently described, should there be evidence that the stomach is oppressed with undigested food or with bilious secretions, twenty grains of ipecacuanha, in a cup of warm water, may be given at once, and fifteen grains in half an hour if the first does not produce emesis, smaller doses being repeated as may be required to produce a free emetic effect. After the stomach is well washed out (warm water or weak chamomile tea being taken to facilitate the vomiting), and the nausea has subsided, five or six grains of blue mass, or four or five grains of calomel, and an eighth of a grain of morphine, should be given, and a similar dose repeated in from three to five hours. Unless free diarrhœal discharges follow from the effect of the ipecac. and the mercurial, in four hours after the last powder, a saline cathartic, sulphate of soda, sulphate of magnesia, or Rochelle salts, etc., in a dose of from four to eight drachms, well diluted, and perhaps in warm water, with some aromatic added, should be administered. Should this not produce a cathartic effect in four or five hours, the dose, in quantities thought necessary, should be repeated. After this operation an opiate should be given, with a moderate quantity of ipecacuanha—say one fourth grain of a salt of morphine, with from one to three or more grains of ipecac.—and the dose repeated sufficiently often to obtain a fair, decided anodyne effect of the morphine; and the quantity of ipecac. may be increased to the larger doses, if nausea is not produced and the patient is not made uncomfortable by it. In some cases, bismuth in free doses exerts a soothing effect and agrees well with the stomach.

This treatment might be continued for one or two days at least, and the after-treatment should be governed by the conditions presented. If the eyes are yellow and the tongue much coated, a few grains of a mercurial might then again be given; and if only mucous and bloody discharges have occurred, and the patient's strength has not been greatly impaired, this should be followed by another saline laxative; and this, again, by the opiates. Should the tenesmus be great, the opiates might be given by enema, in a moderate quantity of some bland fluid (thin, well-made starch answering a good purpose). When laudanum is the form of opiate it is commonly given in starch, but morphine or some aqueous preparation of opium is as well given in water. Opium or morphine suppositories, with cocoa butter, are often better borne than enemas. In children, where neither enemas nor suppositories will be retained, morphine dissolved in glycerine, or mixed with a little fresh butter, may be applied by the finger of the nurse to the verge of the anus, or just within the sphincter, with a decidedly soothing effect. The quantity must be properly regulated, as absorption takes place, and a general as well as local effect is produced.

Morphine, hypodermically, may be used here as in other cases, when thought advisable. Its general soothing effects are more marked, when used in this manner, than in any other. Should the pain be great in the abdomen, fomentations or inunctions of extract of belladonna might be applied.

The laxatives might be repeated or not, according to the amount of fever, the strength of the patient, and the amount and character of the discharges. Should there be much fever, and should the case present no adynamic characteristics, saline laxatives in small doses may be repeated once in four or five hours, thus adopting the saline treatment.

In any of the cases where laxatives or cathartics have been mentioned, castor-oil may be used in place of the salines, and would be preferable where there was much debility, or where the salines produced an irritating or depressing effect. Mucilaginous drinks, or emulsions of almond-oil, might be given in place of the small doses of the salines, in cases of a more adynamic character.

If the disease persists for ten days or more, there will be reason to apprehend the advent of the suppurative stage, with denudation and ulcerations of the mucous membrane. The salines, as a rule, must now be discontinued, and oils and emulsions, if laxatives are required, should take their place.

In this stage of the disease, and sometimes earlier, I have found *much benefit* from the use of the *turpentine emulsion*, to which reference has several times been made, and for which a formula has already been given. I cannot too strongly express my opinion of the utility of this preparation in many cases at this stage of the disease. A similar condition is now present to that which exists in the ulcerative stage of Peyer's glands in typhoid fever, and in the advanced condition in other forms of muco-enteritis previously described.

A formula is here repeated :

℞	Oil of Turpentine	ʒiijss
	Tinct. of Opium	ʒiij–jv
	Gum Arabic (pulv.), White Sugar	āā ℥ss
	Camphor Water	℥iij

M.—For emulsion. Dose ʒj, once in four or six hours.

Local alteratives and astringents may now be useful, the more unequivocally as the case approaches the chronic state. Injections of solutions of *nitrate of silver*, of the strength and in the manner described under the head of muco-enteritis, will often now be of the greatest service. Trousseau used from ten to twelve grains to eight ounces of water. Other local alteratives or astringents, such as the preparations of tannin, or vegetable infusions containing tannic or gallic acid as the basis; sulph. of zinc; weak solutions of carbolic acid; the astringent preparations of iron; acetate of lead, three to five grains to the ounce; chloride of zinc, one half to two grains to the ounce, etc., are articles from which selections may be made to act as astringent and alterative enemas. In the meantime the general treatment must be adapted to the condition which the case has assumed. Tonics and astringents internally may be required; and throughout, the diet and all the hygienic arrangements will require careful attention. The diet and the internal remedies now will not differ materially from those advised in muco-enteritis. Dr. Bartholow says: "When destruction of the mucous membrane is beginning, the most effective remedies are corrosive sublimate, sulphate of copper, sulphate and oxide of zinc, acetate of lead, bismuth, arsenic, etc. Of this formidable list, sulphate of copper and arsenic are most effective. They ought to be combined with opium." (Practice, p. 89.) He advises Fowler's solution in doses of one drop with from five to twenty drops of deodorized tincture of opium every three hours. The sulphate of copper is advised in doses of one twentieth of a grain with one eighth or one twelfth of a grain of morphine every three hours. It must require very accurate discriminating powers to determine how much of the good effects of these prescriptions is due to the arsenic or copper, and how much to the opiate. The proof of the real efficacy of these alterative articles in such doses needs confirmation. The fluid extr. of coto bark has lately come into use in subacute stages of dysentery, and is highly spoken of by some whose opinions are worthy of respect. It is given in doses of ten or fifteen drops with a drachm of paregoric.

When a malarial influence is present, and the symptoms present any periodicity indicative of that influence, *quinine* must be given in full antimalarial doses, but not long continued in such quantities. The very striking effects which I have so repeatedly seen from it, not only in controlling the fever and periodicity, but the inflammation of the intestines and the dysenteric symptoms as well, have led me to prescribe it in connection with opium, in cases where there was no reason to suspect the presence of a malarious influence; and the beneficial effects in many cases of this kind have been almost as striking as where a malarial influence was evident. Dr. Woodward, in the Army Report before referred to, mentions the strikingly beneficial effects of quinine in antipyretic doses. The frequent reference to the use of full doses of quinine in various conditions of inflammation and fever may to some, not practically familiar with such use, seem routine and extravagant; but if it be an antipyretic and antiphlogistic agent of great value, as I believe it is, it is applicable to a large number of diseases where fever and inflammation are present, and therefore requires to be frequently mentioned.

The profession must ultimately become familiar with the fact, that most inflammations, as well as the febrile state, are materially influenced, and often abruptly terminated, by "antipyretic" doses of quinine. The effect of salicin, salicylic acid, or salicylate of soda may be similar, but I have not had experience with them in dysentery. Free antipyretic doses must be given, if anti-inflammatory effects are realized. In the most severe and malignant cases of dysentery, the same general principles apply as in the more ordinary forms of the disease, the treatment of which I have endeavored to describe. All depressing agents, however, must be avoided, and full antipyretic doses of quinine should be early given, and tonic doses may afterward be continued.

In the sloughing stage of the severe cases supporting measures, tonics, and stimulants may be tried, and injections of permanganate of potash may be given; but of course in such cases all efforts commonly fail.

Confirmed cases of *chronic dysentery* are exceedingly obstinate and often fatal. The treatment must be conducted on the same principles as in those cases where the disease is approaching and merging into that state. Tonics and astringents internally—the liquor ferri-ter-nitratis, sulph. of iron or copper with opium, the turpentine emulsion, and other balsamic preparations, as described in chronic muco-enteritis, should be tried. The local application of nitrate of silver in stick, after cleansing the rectum, if the ulcerated surfaces can be reached; or by injections when higher up, affords the greatest prospect of relief. Other local and internal remedies may be tried, such as nitric acid locally, strychnine and nitric acid, stimulants, etc., internally, as already advised in similar or identical forms of muco-enteritis. A change of climate may succeed where other means fail.

The complications of dysentery, such as pyæmia, abscess of the liver, etc., will call for the treatment which these affections demand in other cases, taking into account the dysenteric condition. Not only the more severe complicating accidents, but special symptoms occurring at any stage of dysentery will require attention and such treatment as their relief demands. The catheter must be used when the urine is retained, but with care, as the urethra and bladder are often exceedingly irritable, and more or less severely inflamed. Fomentations, the warm bath, etc., may afford relief, but the use of the catheter where there is much distention of the bladder must not be delayed. The mistake should be avoided of selecting too small an instrument where no firm organic stricture of the urethra exists. A good-sized instrument is more easily introduced and far less dangerous than a small one.

Too much attention cannot well be given to the diet, but it will not differ from that applicable in other cases of muco-enteritis, and to the statements under that head the reader is referred.

The sequelæ, such as impairment of the function and contraction of the intestine, etc., must be treated by sustaining measures and hygienic regulations.

An inflammation followed by ulceration of the lower intestines, with dysenteric symptoms, sometimes follows the free use of mercury —a condition of these parts being induced similar to that in mercurial stomatitis. The chlorate of potash at first, and the iodide of potassium afterward, as in other cases of mercurialization, will be required.

It will be inferred from the discussion which has preceded, that astringents are disapproved of in the acute forms of dysentery. They can be useful only in very exceptional cases, and are generally decidedly hurtful. The temptation which some seem to have to resort to them must be resisted, and even opiates must be used with discretion. An acute inflammation will be aggravated by an irritating astringent, and while the inflammation is present and active, the secretion and discharges unload the vessels and procure relief. Opium is given, not to suppress directly the secretion, but to allay irritation and check the inflammatory processes. Its action in checking the secretion, except as it does so by allaying inflammation, is not generally desirable. If it operated directly and only as an astringent, its effect in acute dysentery would, as a rule, be harmful. Its claims to be used in acute cases rest entirely on other properties.

In describing the treatment of dysentery, I have deviated from the custom which I have adopted in most cases, of giving the treatment my experience and judgment lead me to think best, without entering upon particular descriptions of other methods which I cannot so fully approve. This, however, is a disease of such wide prevalence, and often of such great severity, occurring under such a variety of conditions, and presenting such different types and peculiarities, that I have felt bound to mention a variety of views which are entertained, and to describe a variety of methods which are in favor with those whose opinions are entitled to respect. I do not feel myself bound to any special method, and would encourage a choice of courses to be pursued, according to the experience and judgment of each practitioner in the various localities and seasons, and in the various forms in which he meets the disease. The medicines for dysentery more particularly to be studied are—opium, saline cathartics, castor-oil, mercury, oily emulsions, ipecacuanha, astringents, turpentine emulsion, nitrate of silver, and quinine.

HEMORRHOIDS.

Hemorrhoids, especially so far as their local conditions and mechanical treatment are concerned, come under the province of surgery. No special description of this common affection will therefore be given. But as complications or results of hepatic obstruction, portal congestion, and constipation, and as causing a variety of reflex irritations, and by the loss of blood, anæmia and debility, etc., they often come under the observation of the physician.

The management of hemorrhoids, so far as the physician is specially concerned, consists in the avoidance and removal of their chief causes, and in the treatment of the conditions which they induce.

Perhaps the most frequent cause of this affection is constipation. The causes and treatment of this condition will be considered in another connection, and need not here be entered upon. Obstructed portal circulation, the other prominent cause, will also receive attention elsewhere; and the various affections, the results of anæmia and reflex irritations, produced by hemorrhoids will also be treated of in their appropriate places. Nothing more need be said here than that the subject has much importance, as the disease is so frequent; and that thè physician will often have occasion to deal with those conditions which lead to and result from this affection of the veins and tissues of the rectum.

Much the same may be said respecting anal fissure.

Both of these affections should receive the prompt attention of the practitioner, and should, as soon as possible, be removed. Their influence upon other diseases and the general conditions of the system is too often overlooked. The directions in surgical works respecting the treatment of hemorrhoids and fissures are referred to. It may be well to state, however, that in the case of hemorrhoids, in the acute attacks of inflammation of these tumors which are liable to occur, prompt and immediate treatment when the irritation, pain, and swelling begin, by unloading the bowels with a simple enema, enjoining absolute rest, and applying soothing and astringent preparations locally, such as a solution of acetate of lead and acetate of morphine, will frequently save much suffering.

The removal of the tumors by surgical means, when they become permanent, constitutes the radical cure.

INTESTINAL HEMORRHAGE.

Passages of blood from the bowels have already been spoken of under other heads.

The lower bowels are subject to hemorrhages from various causes, such as portal congestion, ulcerations which open vessels, malignant tumors, etc. Whenever such hemorrhage occurs, its source and cause should, if possible, be determined, and treatment applied according to the indications presented. The blood from this part of the intestinal canal is generally passed off soon after its emission from the vessels, and is, consequently, fresher and less black than that which comes from the stomach or upper intestines. Besides the general means of arresting hemorrhage, such as rest, internal astringents, ergot, opiates, etc., local means, cold and astringent injections, and when within reach, direct internal pressure, are indicated, and are more likely to be efficient than when the source of the bleeding is higher in the canal; and these means should be promptly applied as required. Pieces of ice introduced into the rectum and allowed to dissolve there will often be efficient, and injections of solutions of alum, perchloride of iron, tannin, etc., in quantities of about four ounces, or less when the source of the hemorrhage is very low—sufficient to reach the bleeding part, but not too much to be retained—are also applicable. Quiet and the horizontal position are very important; the bowels should be kept from moving for some days afterward by opium and restricted food; and when a movement is about to occur, the fæcal matter should be liquefied as much as possible by injections of cool or cold water.

The anæmia and other derangements following intestinal hemorrhages will require tonics—iron, bitters, etc.—and a proper generous diet, as after other losses of blood.

The rectum is liable to a local inflammation and ulceration of its mucous surface independent of dysentery, as has already been described. Various causes—the presence of ascarides, long-continued constipation, the pressure of a retroverted uterus, or an enlarged prostate gland, or the presence of hemorrhoids, or fissures, etc.—produce this state.

A sense of uneasiness, tenderness and pain, and occasional mucous discharges would mark the condition. There would not, however, be the general history and general symptoms of dysentery.

The treatment would consist in removing the causes, and in such local treatment—soothing, astringent, or alterative—generally by injections, as the particular condition may require. The principles of treatment will be the same as in other inflammations or ulcerations of mucous membranes. The direct application of a stick of nitrate of silver or the mitigated caustic might be proper here, as in the ulcerations of chronic dysentery.

Polypoid growths and other tumors may appear in this situation, but they belong to surgery, and require only such attention from the physician as the general symptoms which may be induced demand. Removal by surgical means is the proper radical remedy.

ACUTE PERITONITIS.

Peritonitis is an inflammation of the serous membrane lining the abdominal cavity and investing the various organs which it contains. This inflammation may be *acute* or *chronic*, may be limited to a part of the membranes, when it is said to be *local;* or may extend over the whole surface, when it is *general.* It may be an independent, original affection, when it is said to be *primary;* or it may be the result of some other diseased condition, when it is *secondary.*

The peritoneum is a membrane of such great extent, not only covering all the abdominal viscera, but increased by its various folds, that an inflammation of its entire surface is a formidable affection. From variations, however, in the extent, intensity, and special character of the inflammations, the gravity of the disease varies in different cases. Still, every form demands the earnest attention of the physician, and a careful account of its causes, symptoms, and treatment seems necessary.

In the discussion of the process of inflammation, that which occurs in serous membranes was described, and as the peritoneum is a typical serous membrane, a special and minute pathological account of its inflammation will be unnecessary. Hyperæmia, exudates within its tissue and upon its surface, serous, plastic, and purulent, with softening, thickening, and other changes in its texture, mark the disease anatomically.

Symptoms.—An attack of primary acute peritonitis sets in with a chill, followed by a high fever, sometimes at first with a full-bounding pulse; but often the shock of the disease upon so extensive a surface produces depression and a contracted but rapid pulse, and sometimes quite speedy collapse ensues.

Its chief local symptomatic phenomena are pain and tenderness. The pain is burning and lancinating, aggravated by motion, usually severe, and extends, when the inflammation is general, over the membrane to the whole abdomen; but in most cases it is more intense in particular situations, oftener perhaps than elsewhere in the right iliac region. The tenderness is marked on pressure, on coughing or sneezing, and even the weight of the bedclothes is often distressing. The abdominal muscles are generally rigid, and as the disease advances the abdomen usually becomes distended and tympanitic, sometimes extremely so; the bowels are commonly constipated, and vomiting is a frequent symptom.

Free movements of the diaphragm give so much pain that the respiration is shallow and mostly thoracic, particularly when the difficulty of respiration is increased by the distention of the abdomen. From the tenderness, and the more or less paralyzed condition of the abdominal muscles, but slight expiratory efforts can be made, and therefore the voice is feeble. In the latter period of a severe case hiccough is a frequent symptom, and the vomiting of a greenish or very dark fluid is common. The face is haggard and expressive of severe suffering; the patient lies upon his back with the knees drawn up to relieve the tension of the abdominal muscles and diminish pressure upon the viscera, as well as to prevent the weight and pressure from the bedclothes. Retention of urine not unfrequently occurs, requiring the use of the catheter. The pulse is frequent, and sometimes very small and feeble from the first, increasing in frequency and feebleness as the disease advances in severity; though in the early stage it is sometimes more full, and often quite hard. In fatal cases the pulse becomes extremely frequent, weak, and often irregular, and may cease at the wrist some time before death. The temperature, especially of the extremities, varies in different cases. It may be only moderately elevated in the cavities, or may rise to 105° F. or higher. In the collapsed condition the extremities become cold, and even the central temperature may fall below the normal. The suffering usually ceases before consciousness is lost, and the mind is often intact almost to the very last, the patient becoming hopeful and almost cheerful while death is immediately impending.

Occasionally cases occur in which the shock at the onset is so great and the collapse so speedy, that none of the usual suffering is experienced. In these cases the real nature of the disease may not be known until a post-mortem examination reveals the condition. In such cases poisoning, or improper treatment might be suspected, and an autopsy becomes very important. If the death is very speedy, but little exudate may be present, but a careful examination will not fail to show the nature of the disease. Cases have come within my observation where grave suspicion was removed only by the autopsy.

Diagnosis.—The diseases which have some features of resemblance to peritonitis, and from which it should be distinguished, are—enteritis; enteralgia with dermal tenderness, especially in hysterical women; colic, and possibly internal hernia, or other forms of intestinal obstruction. From muco-enteritis the diagnosis may be readily made by the less degree of pain and tenderness, and by the diarrhœa which accompanies the intestinal catarrh. From phlegmonous enteritis the distinction is not so easily made, nor is it so important, as the peritoneum is involved in both, though to a more limited extent in enteritis; and while the pain and tenderness are not so general, the treatment and prognosis are similar.

It is of more importance not to confound peritonitis with colic, or the neuropathic affections. These are infinitely less serious, and do not require the same treatment. In colic the pain is more intermitting, and is generally relieved by pressure. The patient usually moves or throws himself about with freedom, while in peritonitis he instinctively avoids motion. In hysterical neuralgia there may be much cutaneous hyperæsthesia, and great shrinking from slight pressure; but firm pressure upon a broad surface will be borne, and often with relief. In neither of these cases will there be the fever, which is often preceded by a chill, nor the rapid pulse and profound shock of peritonitis. In exceptional cases there may be difficulty of diagnosis. Dr. Flint witnessed a case, supposed to be colic, where the patient, instead of keeping a fixed position, writhed in his distress, and did not take to his bed until shortly before death. The autopsy revealed acute peritonitis. In another case, where a similar condition was found *post mortem*, active vomiting and purging led to a diagnosis of cholera. These cases were, however, probably complications, the symptoms of peritonitis being obscured by the other conditions.

Etiology.—The causation of peritonitis is often important to be known, both with reference to diagnosis and prognosis, and sometimes with reference to the treatment. Primary idiopathic peritonitis may occur from the ordinary causes of internal inflammation, and the disease may then present a typical form; but it is more frequently secondary, the result of some other diseases or pathological conditions, or of injuries inflicted upon the peritoneum or neighboring parts.

When caused by exposure to cold and wet, etc., it may occur in the robust and healthy, but it is more likely to attack the delicate and impressible, and those laboring under other diseases—of the heart, lungs, liver, or kidneys. It is particularly liable to occur, either in an acute or more chronic form, in cirrhosis of the liver, in Bright's disease of the kidneys, and in tuberculosis. Not unfrequently it is due to simple extension of inflammation from other parts—from the stomach, intestines, liver, spleen, kidneys, or bladder, and especially from the uterus in the puerperal state, or at the menstrual period; and often it is produced by operations upon, and applications to, the pelvic organs of females. It more frequently arises from inflammation of the ovaries, uterus, and other female pelvic organs, especially after parturition and abortions, than from any other causes.

As we have already seen, it is not an unfrequent occurrence from perforation of the intestines in typhoid fever, and from other forms of ulceration, from penetrating ulcerations of the stomach, the cæcum, and the vermiform process, and from abscesses in the iliac region, etc. Rupture of an hepatic abscess, of the gall-bladder or bile ducts, of hydatid cysts, of ovarian cysts, or of psoas, renal, or other abscesses, may all cause the discharge of irritating matters into the peritoneal cavity, to be followed by peritonitis. Physical violence, such as wounds, blows, or lacerations of the abdominal walls, or of special abdominal and pelvic organs, is often followed by peritonitis; and lastly, it may be the result of pyæmia, or of the transference of erysipelatous inflammation from the surface. Cases of this latter kind I have seen several times.

Pathological Anatomy.—The exudates in peritonitis, where the disease continues a sufficient length of time to allow of its full development, are usually abundant. The inflammation, though it sometimes remains local, and generally is more intense in some parts than in others, very commonly spreads over the entire surface to a greater or less degree.

When the inflammation is of a moderate grade, the effusion is chiefly serum. When it is of a higher grade, the exudate is fibrinous and corpuscular—coagulable lymph or false membrane—and in some cases it is chiefly purulent. In many cases these elements are more or less mingled. In a majority of acute cases, on post-mortem examination, straw-colored, semi-transparent plastic matter will be found filling the sulci between the folds of the intestines, much more in some situations than in others, while a serous fluid, sometimes tinted with blood, will be found at the flanks or gravitated into the pelvis. In this fluid, and sometimes adherent to the membrane or freely mingled with the more solid exudate, will be found pus corpuscles in more or less abundance.

In milder but more protracted cases the abdomen will often be found distended with serum, in which may be flocculi of coagulable matter, or some pus corpuscles, or both ; but sometimes nearly pure serum is found. In other cases, especially in septic or pyæmic and puerperal peritonitis, the chief exudate may be pus.

In cases of recovery, where the chief exudate is serum, it will often be readily absorbed away, leaving little or no trace of the disease behind. When plastic exudates are poured out, and remain in that form after the inflammation abates, organization is likely to take place, and the subsequent contraction of bands or masses of this false membrane may constrict the intestines and obstruct their function ; and sometimes, especially after repeated attacks, nearly the whole body of the intestines may be conglomerated into an inextricable mass. A case of this kind in a young unmarried woman came under my observation several years ago, where pregnancy was suspected from the presence of a rounded tumor which filled the abdomen, appearing and feeling much like the gravid uterus at the seventh or eighth month of gestation. A vaginal examination proved the non-existence of pregnancy, and, not long after, complete occlusion of the intestines gave an opportunity for a *post-mortem* examination, which showed the condition of things above indicated.

A hasty professional opinion of pregnancy had given an unquestionably virtuous young woman a great deal of annoyance and mental distress. Single bands may form, embracing a loop of intestine, or a greater or less extent of intestine may be compressed and finally obstructed.

These false membranes, without producing such serious consequences, may give rise to constipation and pain, and to subsequent attacks of inflammation. Sometimes plastic adhesions surround a quantity of pus, and distinct peritoneal abscesses result. These may find their way through into an intestine, the pus being discharged by stool. Where perforation of an intestine occurs, adhesive inflammation may confine the intestinal matters, the peritonitis may be local, and a fæcal abscess may form. The course of these abscesses will vary, some reopening an intestine, some bursting into the peritoneal cavity, some approaching the surface, etc.

Prognosis.—This is always grave in peritonitis. Its course is very various, depending upon its extent and severity, and upon the power of endurance of the patient. The inflammation may soon be arrested, it may subside after some days or weeks, or it may become chronic. On the other hand, it may prove fatal in a day or two, or even in a few hours, or it may result in death in one, two, or several weeks, or, by its accidents or consequences, at a much later period.

Peritonitis dependent upon wounds, operations, and injuries, belongs to the province of surgery; and its peculiarities as connected with the puerperal state and with uterine and ovarian diseases, to the department of obstetrics and gynæcology, and need not here be particularly described.

That form which depends upon gastric or intestinal perforation is of course sudden in occurrence, and is generally marked by severe pain and violent symptoms. In exceptional cases, however, the patient is overpowered by the shock, and falls into collapse without the usual suffering; and when rupture of the intestine occurs in a delirious or more or less comatose state of typhoid fever, the patient may not have sufficient sensibility to manifest the usual symptoms. In such cases the perforation and peritonitis can only be positively known after death.

Treatment.—The principles of treatment in this formidable affection can soon be stated, though here, as elsewhere, their application requires discrimination and judgment.

The disease is so rapid in its development, and the causes are of such a nature, that there is little opportunity to attempt their removal. We have to deal with consequences rather than causes, and, unfortunately, these are too often beyond our control. There are certain rational indications, however, which should be followed, as affording the greatest prospect of benefit. We have, as leading indications or objects, to abate the inflammatory action, and to prevent or relieve the shock and depression which so severe and extensive an inflammation is sure to produce. In the early stage, before shock and depression are marked, means may be used for directly abating the inflammation. If the patient is vigorous and abounds in blood, and is not too much depressed from the shock of the onset, an early venesection, or the application of a good number of leeches to the abdomen, I cannot doubt, would be proper. I am fully aware of the statements by some, who are accepted as authorities, that as the patients die from asthenia—from failure of the heart's action—blood-letting or other "debilitating" measures are contra-indicated. A moderate, or even considerable loss of blood, where there is a free and possibly a superabundant quantity in the system, thrown with great rapidity and often with unusual force, to inflamed parts, or accumulating in and oppressing particular organs, is by no means necessarily "debilitating." On the contrary, the action of the respiratory and the circulating organs may become more free, the innervation may be improved, as the immediate effect of the abstraction of blood ; and if the inflammatory action be abated, the after-shock and depression will be lessened.

But theoretical considerations must always be subordinate to the results of experience, when these are unequivocal. While I am not prepared to say that experience is unequivocal in favor of blood-letting in any cases of peritonitis, yet I believe that both theory and experience fully justify, if they do not positively demand, the use of this remedy under the circumstances above named. In many cases, however—in the majority as met with in practice, either from the time at which the patient is seen, or his condition as to the amount of blood, or the state of the circulation—I am quite as confident that bleeding would not be justified. It is impossible to express in precise language all the indications and contra-indications for the use of this remedy. It is easy to say that it must be left to the discretion and judgment of the physician ; but this is not sufficient for the information of the student, nor for the guidance of the inexperienced practitioner. But what can be said that is satisfactory ? If the patient is plethoric, the pulse strong, the lungs or the brain congested, there need be no hesitation. A bleeding may be well borne and useful where all of these conditions are not present. But when the shock is profound, the heart's action feeble, and the depression great, the case is quite as clear ; bleeding is, of course, not to be practiced. In some of the intermediate cases there will be doubts, and when such doubts are felt it is better, perhaps, to desist from the practice. As patients are usually met with, venesection will very seldom be required, and the application of leeches in only a minority of cases. In deciding as to the use of this remedy, all the conditions must be taken into the account, and the judgment of the practitioner must determine.

Respecting the means for soothing the sufferings of the patient, keeping the inflamed parts at rest, and preventing the severity of shock, there is happily less doubt. *Opium* is the great remedy in this disease. It should be given liberally, so as to relieve pain, and produce a decided medicinal effect, but not to the extreme of narcotism. The susceptibility of patients differs so much that no positive rule can be given as to the dose, but a fair average would be two grains of opium or a fourth or third of a grain of a salt of morphine once in from three to five hours. Some adolescents, or young adults, are very susceptible to the effects of this remedy, and there must be caution in its administration, until the quantity that can be borne is ascertained. But a sufficient quantity should be given to contract the pupil, though not excessively; to diminish the frequency of respiration, but not greatly; and a steady, and not vacillating effect should be produced. Morphine hypodermically may be used with perhaps more prompt and more precise effect; and the addition of atropine is thought by some to render its therapeutic action more efficient. An average quantity used in this way would be one fourth of a grain of sulphate of morphine, with $\frac{1}{120}$ of a grain of sulphate of atropine, once in from three to six hours. But here the size and frequency of the dose must be left to the observation and judgment of the physician. There is no other alternative. Small mercurial doses may be added occasionally to prevent, if possible, so complete a suppression of some of the secretions as opium by itself might produce. Moderate quantities of a neutral mixture might also be given for the same purpose.

Some advise, in addition, in the cases where the depression is not marked, the use of veratrum viride, aconite, or jaborandi, in cautious doses; but their depressing effects upon the heart are as much to be feared as those of blood-letting. They must be used with caution.

I have observed that those writers who have used quinine as an *antipyretic* in this, as in so many other inflammatory diseases, speak strongly of its good effects. Of its action in abating high temperature there can be no doubt, and so far as that reduction is particularly desirable, the remedy for that purpose seems indicated; and I must repeat the opinion, that its effects are not confined to the diminution of temperature, but that it operates also on other elements of the inflammatory process. It has the additional advantage, that even in doses sufficient to diminish the frequency of the pulse and produce free perspiration, it sustains rather than depresses the general life forces. I cannot doubt that bringing the patient under the full antipyretic effect of this remedy will, as a rule, decidedly tend to his benefit. So far from being incompatible with opium, it aids the sustaining and soothing effect of that article in relieving shock. The opium as well as the quinine not only relieves shock, but tends powerfully to diminish inflammatory action. The use of these agents renders bleeding less necessary, and should reconcile its more ardent advocates to its present greatly diminished use. The quinine, in order to its proper effect, must be given in decided antipyretic doses. Here, as in other fevers and inflammations, the quinine should be given in a few free doses, frequently repeated, until a strong impression is made, or in a single large dose, and then suspended until the fever begins to return. This is the most efficient and least objectionable method. From twenty to thirty or forty grains should impress the system at the same time, but it is best introduced in divided doses of ten or fifteen grains. Such large doses must not, however, be long continued, lest injurious effects be produced on the brain and nervous system.

The salicylate of soda in still more free doses may answer an equal or even better purpose, and it is at present largely superseding quinine as an antipyretic; but my own experience with it, except in rheumatism, has not been sufficient to enable me to speak of its use in these cases with the same confidence as of quinine. A combination of quinine and the salicylate is stated by Prof. Huguenin, of Zürich, to be especially efficacious in reducing temperature in typhoid fever, pneumonia, and other cases where antipyretics are required.

One of the great improvements in modern practice is the avoidance of cathartics in peritonitis and phlegmonous enteritis. If at the commencement of the disease there is evidence that the rectum is loaded with fæcal matter, there seems no objection to the administration of a warm water enema for the purpose of removing these accumulations without exciting the bowels much beyond this part; but after this the bowels must be kept at rest, and one of the objects in the administration of opium is to produce that effect. The food taken must be such as leaves little residuum, and the bowels must be kept quiet until the inflammation disappears. They will then usually move spontaneously, and should be aided by no other means than, possibly, a simple enema of warm water.

The avoidance of cathartics, especially in a fully developed or advanced stage, must be insisted upon, as a resort to one even of the mildest kind, such as castor-oil, will often bring back the inflammation in a severe and fatal form when it had greatly subsided or nearly disappeared. A case of this kind is very distinctly remembered where improvement had gone steadily on for a week after the last movement of the bowels, when the attending physician yielded to the fears of serious consequences from the constipation, and directed a dose of castor-oil, which lighted up the embers of the expiring inflammation that soon resulted fatally. Other cases are remembered where, during the active stages of the disease, a cathartic has immediately aggravated all the symptoms and turned the wavering scales in the wrong direction.

Food with the least residuum, and no more than the stomach appears to digest, and the most perfect quiet to the inflamed bowels that can be secured, are essential items of proper treatment. A well-defined desire for a spontaneous movement, from fæcal accumulations in the rectum, should not be resisted, and the passage may be facilitated by a warm water enema very carefully administered. But the patient should not be raised from his recumbent position for the purpose of the evacuation, and the enema should be used only when the desire for a movement is felt. The use of cloths would be preferable to that of a bed-pan, so important is it that all motion, so far as possible, should be avoided. Inattention to details, or wrong directions in what may appear to be trivial matters, may defeat all other efforts, however judicious.

The question of external applications is one often mooted, and is by no means unimportant. The continuous steady application of cold water and warm water fomentations both had their advocates among those of high authority. At first view it might be supposed that if the one was useful the other must be injurious, but this does not follow. In external surgical inflammation, either warmth or cold, applied by water, may improve the condition of the same case; but one or the other will be preferable, according to the particular conditions. So probably in peritonitis. The object of the cold, applied so as to reach the inflamed part, is to constringe the vessels and diminish the morbid molecular changes. The warmth is intended to soothe irritation and pain, and thus allay excitement and modify favorably the inflammatory processes. The application of water to the surface, independent of the temperature, whether by cloths, the spongiopilin, or a poultice, modifies the action not only of the cutaneous nerves and vessels, but, by sympathy, of deeper parts. In determining whether cold or warmth shall be used, the sensations of the patient should be consulted, but other conditions should also be considered. If the patient is vigorous, the heat great, and the action of a more sthenic character, the cold will be better borne and more likely to be useful. On the other hand, if the patient is feeble and depressed, with nervous sensibility predominating, the warmth may answer a better purpose. For the application of cold in these cases Kibbel's fever cot is the best contrivance. Prof. Thomas, of New York, has reported cases of peritonitis, after abdominal sections, where the application of cold water to the abdomen by means of the cot appeared to have a very decidedly beneficial effect, which has given encouragement to its use. It may be as applicable to idiopathic as to traumatic peritonitis, where similar symptoms are presented. By means of the cot, water can be used at any temperature desired, with this advantage over the cold bath, that the extremities can be kept dry and warm. The construction and use of this cot has already been referred to.

Counter-irritation, as by sinapisms or turpentine stupes (cloths wrung out of hot water and sprinkled with oil of turpentine) may also be useful. In whatever form of application, much weight must not rest upon the abdomen.

In subacute forms of the disease, where the inflammation and its results linger, blisters to the abdomen, not too large or too frequently repeated, may be of essential service. The good effects of a blister in such cases are often quite striking. In severe cases and in the acute forms of the disease a large blister would be likely to add to the shock, and is contra-indicated. In subacute and more chronic cases, this danger does not exist, and the blisters aid the absorption of inflammatory products. In this stage applications of tinct. of iodine are useful, and, according to some, mercurial frictions also. Iodide of potassium may then often be given internally with much advantage.

The diet should be a matter of much care throughout the disease, and should be governed by principles which have already repeatedly been stated. While proper nutrition is desirable, forcing upon the stomach food it cannot digest is, of course, particularly injurious where the intestines must take part in lodging or getting rid of the superfluous material, and where it is so desirable to keep them at rest.

Particular symptoms may require palliation by special means other than those mentioned. Nausea and vomiting may require bits of ice, small effervescing draughts, hydrocyanic acid, sinapisms to the epigastrium, etc.; and the condition of the stomach may require that other medicines should be given hypodermically, and food, and perhaps stimulants, by enema. Quinine, in the free doses necessary to produce antipyretic effects, may irritate the stomach. Dr. M. Charteris, of Glasgow, asserts that thirty grains of quinine and fifteen of tartaric acid, dissolved in half an ounce of water, make a solution which may be freely injected hypodermically without local irritation. Not more than twenty minims should be injected at one point, but several injections may be simultaneously made. Artificially digested meats, milk, beef-tea, etc., with opiates, or quinine, or brandy if required, may be given by the rectum. Some cases are remembered where obstinate vomiting which had resisted various other measures was promptly arrested after taking two drops of creosote in a little sweetened water.

In case of great distention of the bowels by gases, a tube may be carefully introduced into the rectum and carried as high up as possible, or as necessary to secure their escape. The introduction of the tube will be greatly facilitated by having the chest as low and the hips as high as possible, without too much physical disturbance of the patient. The knee and chest position is the one most desirable.

When great depression occurs from the shock, besides the quinine and opium which are perhaps most reliable, alcohol, ammonia, etc., may be cautiously tried. Bartholow regards the salts of ammonia as important remedies in the advanced stages of acute peritonitis, and says, "ten grains of the carbonate of ammonia in an ounce of the solution of the acetate, every four hours, when the exudation is going on, is, the author believes, a remedy of the highest utility."

When peritonitis accompanies and is dependent upon any other disease, reference must be had to its conditions in the treatment.

After convalescence the liability to relapses must be remembered, and great caution as to exposure, exertion, food, etc., must for a considerable time be observed.

A form of acute idiopathic suppurative peritonitis which occurs in children, and is caused by exposure to cold, has lately been described. Clinically it does not materially differ from other forms of acute peritonitis, but pus is produced in free quantities, and it is thought that it may depend upon some previous diseased condition of the intestines resulting in perforation.

There is sometimes an enormous accumulation of gas of a very fetid character; and pus has, in some cases, been evacuated through the rectum, vagina, bladder, or the abdominal parietes. It is probable that in some of these cases the chief seat of the inflammation is beneath the peritoneum, and the accumulation of the pus is without the peritoneal sac.

The treatment will not materially differ from that described for other cases of peritonitis; though to check the suppurative tendency, as well as to modify other conditions, quinine in antipyretic quantities will be particularly applicable.

CHRONIC PERITONITIS.

A subacute and more or less chronic form of peritonitis sometimes follows the acute, with liability to acute attacks. It is very seldom chronic from the beginning, except when it occurs as a symptom or complication of some other diseased condition. The most frequent cause of the chronic form is tuberculosis, but it not unfrequently accompanies Bright's disease of the kidneys, and it also sometimes occurs in chronic alcoholism, but then for the most part where cirrhosis of the liver is present. It also presents itself in a chronic form in many cases of carcinoma within the abdomen, in ovarian and other tumors, and in some diseases of the uterus and its appendages. Its dependence in a chronic form upon intestinal and adenoid mesenteric affections must be recognized.

As a symptom or result of these other diseases it is more or less severe according to their nature; but it is generally exceedingly grave, and amenable only to palliative treatment.

Its general symptoms, in all these cases, are pain and tenderness of the abdomen, a moderate degree of fever, and in most cases either effusion of serum or of plastic matter, or thickening of the membrane, often of the omentum, which presents a hard and irregular or roughened feeling on palpation. Tympanitis may or may not be present.

Tubercular peritonitis is where inflammation is associated with tubercles in the membrane and elsewhere, and often with tuberculous ulcerations of the mucous membrane of the bowels.

It sometimes occurs in what is called acute tuberculosis, where miliary tubercles are deposited in various organs of the body at the same time—lungs, liver, etc., and in other serous membranes, the pleura, etc., as well as in the peritoneum. It is accompanied by increase of temperature and other symptoms resembling typhoid fever, and with an inflammation of the serous surfaces which is comparatively mild, but persistent; and when occurring in the peritoneum the inflammation may be termed chronic or subacute peritonitis. This form of general acute tuberculous disease is generally fatal in a few weeks, and will be considered in another connection.

Chronic tubercular peritonitis oftener occurs in connection with more chronic tuberculosis of the lungs and of other organs, and especially of the intestines. In complicated cases, or in what is called abdominal phthisis, there are deposits of miliary tubercles in the peritoneum, with a slow persistent inflammation. In some cases, particularly in children, the peritoneum is the chief, or almost exclusive seat of the local disease; but generally the abdominal lymphatic glands are enlarged by free tubercular deposits. The symptoms are a rise of temperature and a rapid pulse; the fever assumes a hectical form; there will be debility, emaciation, pain and tenderness of the abdomen, though this may be slight, and generally, as the disease advances, the abdomen enlarges and is hard and nodular on palpation; but often there is free serous effusion which may obscure the latter symptom.

Anatomically the peritoneal tubercles are sometimes miliary and gray, of very small size, giving the whole membrane a roughened feeling and destroying its transparency. Sometimes these tubercles form lobulated masses up to the size of a hazel-nut, and assume the form of yellow tubercle. They are then of an opaque buff color, sometimes mottled with black points, and exhibiting the cheesy appearance characteristic of this form of deposit, but modified by more or less fibroid matter, the result of the inflammatory process, mingle with them or surrounding them. Sometimes, but not often, tubercular layers of considerable thickness and extent, mingled with inflammatory products, will be found between the intestines and elsewhere, causing the adhesion of parts: but adhesions are commonly the result of effused lymph and the formation of false membrane which accompanies the morbid process. The large tubercular masses are generally few in number, but the small are innumerable, and sometimes, where the miliary tubercles alone are present, the peritoneal surface is covered with a grayish lymph having more or less tenacity and toughness and agglutinating the organs together, and in it will be seen tuberculous points.

Other evidences of inflammation will be present—hyperæmia, serous effusions, and sometimes pus or blood. The serous effusion is by far the most frequent and abundant, sometimes producing great distention. The tubercular deposits in the intestinal walls may soften, produce ulceration, and cause perforation of the intestines from without.

In the progress of pulmonary phthisis tubercular deposits, and finally softening and ulceration, often occur in the intestinal mucous membrane. This condition is apt to be accompanied with more or less peritoneal inflammation, and if the intestinal ulcers penetrate all their coats, as is possible, an acute and violent peritonitis is the usual result.

From the different character and amount of these diseased processes the symptoms will vary in number and intensity, and so far as pointing to peritonitis they are sometimes quite obscure, overshadowed by the existing complications.

The peritoneal tubercular disease sometimes creeps on insidiously, while in other cases it commences more abruptly with the ordinary symptoms of peritonitis; but in either case the symptoms at length merge into those of chronic peritonitis, and commonly progress more or less slowly to the end, the time varying from a few weeks to a year or two.

The particular symptoms are pain and tenderness of the abdomen, but not great; a roughened irregular feel is observed on palpation; the abdomen is almost characteristically enlarged by effusion into the peritoneum, by accumulations of gas in the intestines, and by enlargement of lymphatic glands. A hectical form of fever, with rapid pulse, and loss of flesh and strength, comes on, which, with some variations in intensity, usually persists in its course. When the disease is advanced, and the more extensive destructive changes alluded to have taken place, the result is only a question of time; but cases have occurred presenting all the usual appearance of tubercular peritonitis in the early stage, where, under treatment, recovery followed.

Dr. McCall Anderson, of Glasgow, reports cases of the kind ; and under my own observation cases have occurred in which great improvement certainly took place, and where the patients were dismissed and lost sight of, apparently cured. Whether in the few instances so observed the symptoms returned, I regret to be unable to say. However it may be with particular cases (and the obscurity of an early diagnosis must render such cases doubtful), the general *prognosis* in tubercular peritonitis is in the highest degree unfavorable.

The *diagnosis* is to be made by an observance of the phenomena described, and by excluding alcoholism, cirrhosis of the liver, Bright's disease of the kidneys, and other local diseases within the abdomen ; and by the presence generally in adults, and often in children, of evidences of tubercles in other situations, especially in the lungs.

Treatment.—The treatment of tubercular peritonitis will not differ from tuberculosis in other positions, with the inflammation usually accompanying it. That which seems to me indicated on therapeutical principles and as the result of experience, is as follows : When any degree of acuteness in the symptoms is present—pain, tenderness, and fever—antipyretic doses of quinine and morphine should be promptly given. By keeping the patient a day or two under a proper influence of these medicines the fever and inflammation will be decidedly, though perhaps temporarily, checked ; yet the inflammatory action is not likely to return in an acute form. If so, the treatment should be repeated. If the disease be at an early stage, the patient should be put upon iodide of potassium, in doses of from five to ten grains three times a day ; and this course should be pursued, if well borne, as it usually is, for some weeks, and the abdomen should be painted over, from time to time, with tincture of iodine sufficient to keep up a moderate degree of counter-irritation. In the meantime, especially if there be much weakness or emaciation, codliver oil and extract of malt should be given, commencing with moderate doses, but increasing, as the stomach will bear, to the full ordinary doses. The bowels should be regulated, and the patient, well protected from cold and dampness, should be in the open fresh air as much as possible.

A good, substantial, easily digested, though not excessive diet should be given, and all proper hygienic rules observed. If at any time more acute symptoms occur, the quinine and opiate, or the latter certainly, should be given, while the other treatment is temporarily suspended, but resumed when the more decided fever and inflammatory action are subdued. After a time the iodide of iron may take the place of the iodide of potassium. If the disease and the tubercles have softened, and the ulcerative stage supervenes, little or nothing more can be hoped from the preparations of iodine; palliative and supporting treatment alone will be of use, and the character of the palliative measures will depend upon the particular symptoms.

In chronic peritonitis not tuberculous, the cause must be sought for and must influence the treatment. The inflammation must be checked by the means already indicated. In chronic cases opium cannot be relied upon as in acute cases, and the bowels should not long be kept constipated. They must, in fact, be kept open, and if serous accumulations take place, even the milder forms of hydragogue cathartics may be useful. Alteratives, eliminatives, and counter-irritation will be the most important agents in the treatment, and the particular selection will depend upon the special conditions in each case. The bitartrate of potash, given so as to act as a laxative and diuretic, other more stimulating diuretics when the kidneys will bear them, mercurials in moderate quantities not unfrequently, with such other remedies as the accompanying diseases may demand, should be used. Blisters and iodine liniments will often be useful. The iodide of potassium, here, as in other chronic inflammations with exudates, may be required.

The *chronic peritonitis* of *alcoholism*, commonly connected with disease of the liver and other parts, is but a link in the chain of evils which the poison has fastened upon its victim, and a fatal result is almost sure to follow. However, some of the means already indicated may be tried.

When such accumulation of fluid takes place in the abdomen as to interfere with respiration, and to produce great suffering, the fluid should be removed by paracentesis, though this operation in peritonitis should not be hastily resorted to. The bathing of the inflamed membrane in the fluid, and the gentle uniform pressure which it produces on the hyperæmic vessels may diminish the inflammatory action, and only when the symptoms caused by the pressure demand relief should tapping be performed.

ASCITES.—ABDOMINAL DROPSY.

Ascites is an accumulation of serum within the peritoneal cavity, and this term, and especially that of abdominal dropsy, is commonly applied to such accumulations as are not caused by positive inflammation. There is, however, a modified action of the capillary vessels or lymphatics by which the balance between effusion and absorption is destroyed, the effusion greatly preponderating. This may be dependent upon some morbid process in the vessels of the peritoneal tissue; upon some obstruction and consequent congestion of the portal vessels; upon some cause disturbing the systemic circulation; or some change in the osmotic relations of the blood, and the fluid within the peritoneum.

More or less effusion of serum attends most cases of even acute peritonitis, as we have seen, and a more free quantity the chronic forms. When this is inconsiderable or temporary it does not take the name of ascites, and only when it becomes a predominating condition is it called abdominal dropsy.

Etiology.—Not only tubercle but cancer and other tumors within the abdomen cause serous accumulations; and the bursting of ovarian cysts or of hydatids may present a fluid within the peritoneal cavity.

The most characteristic form of ascites, where dropsy of the peritoneal cavity alone exists, is produced by obstructed circulation of the portal blood through the liver. This may be produced by direct pressure upon the portal trunks, by tumors, or hydatids; but it is more likely to be due to disease within the liver, involving the hepatic capillaries and the veins which open into and flow from them. The most common liver disease producing this effect is cirrhosis, or the "hobnail" or "gin liver," which produces its effect by a slow inflammation and contraction of the fibrous capsule of the vessels. Obstruction of portal circulation may be produced in what is called the nutmeg liver; and other degenerative processes in the organ may have to some extent the same effect.

In obstruction of the systemic circulation, as from organic disease of the heart or the lungs, dropsy of the abdomen may occur in connection with dropsy of other cavities and tissues. It may also be produced, as a feature of general dropsy, by disease of the kidneys, in which too little water is secreted, the albumen of the blood is lost, and urea is retained in the blood and tissues. By the accumulation of water in the system, by the thinning of the blood in the loss of albumen, and by the retention of urea irritating the fibrous tissues, effusion, endosmotic and irritative, occurs; and dropsy of the peritoneal cavity, as well as effusions elsewhere, follows.

Dropsy may result from obstructed circulation through the general capillaries; and the thinness of the blood which occurs in various cachexias and in simple anæmia may so change its osmotic relations as to cause dropsy of this cavity as of other parts. Finally, more than one of these causes, local or general, may be combined in the production of the effect.

The amount of fluid present in the peritoneal cavity varies from a few pints to several gallons. I have removed by tapping, in the same case, thirty quarts at once on several occasions, though it is seldom that the quantity exceeds four or five gallons. The fluid may be clear and quite pure serum; it may be viscid, containing free quantities of albumen and fibrinogen, and fibrinous clots; it may be opaline, or of a yellowish or greenish tinge, or turbid and colored with blood. It is usually alkaline in its reaction, and its specific gravity is less than that of the serum of the blood. The bile acids, and creatin and creatinin, are not unfrequently present in it. The peritoneum itself, when it contains this fluid long, especially in free quantities, undergöes changes in its structure. It becomes sodden, cloudy, and thickened, and sometimes there are evidences that inflammatory changes have occurred.

The general symptoms and the progress of ascites will depend much upon the causes which produce it. The local phenomena can readily be understood. The enlargement of the abdomen when there is a free quantity of water is at once apparent. At the beginning, and when the quantity is small, there is more obscurity. When large it will change the centre of gravity of the body, and cause the head and shoulders to be thrown backward when the patient is standing or walking. The enlargement, when the fluid is free and not confined by adhesions, is usually round and uniform. When the patient is erect there is always flatness on percussion in the lower part of the abdomen; but when the quantity of fluid is not very great, there is tympanitis above, from the lighter specific gravity and floating of the intestines. When the patient lies upon the back the flanks are distended and dull on percussion; and when there is a very large quantity of fluid, the liver, being specifically heavier, often sinks down from the ribs, and its margins may be felt. When fluid forms in the peritoneal cavity, fluctuation can be detected by palpation, and especially by tapping upon one side or part while the hand is lightly held upon the other. By these and other signs it is generally easy to detect the presence of abdominal fluid; but some cases, in consequence of complications, of old adhesions, large quantities of omental or parietal fat, or an œdematous condition of the abdominal walls, may be obscure. A thin, single ovarian cyst may present appearances almost identical with ascites; and practitioners of some distinction have, with a view of relieving dropsy of the abdomen, plunged a trocar into a gravid uterus. An examination, therefore, should be careful, and too hasty a conclusion should not be formed.

Ascites, produced by whatever cause, is likely to press upon the iliac veins and the lymphatics, and cause œdema of the lower extremities. This may early attract the attention of the patient; and shortness of breath from pressure upon the diaphragm is a symptom which he generally soon feels. There will, of course, be a sense of weight, and often pain, or a feeling of distress.

If there be a hernial sac, or a local weakness of any part of the abdominal walls, there may be protrusion, producing irregularities in the dropsical enlargement; and in women the recto-vaginal pouch may rarely be so distended as to protrude through the vulva and present a fluctuating tumor covered by the posterior wall of the vagina.

The symptoms dependent upon the concomitant diseases will be considered elsewhere.

Diagnosis.—Ascites should be distinguished from ovarian or other large tumors in the abdomen; from chronic peritonitis with serous and plastic effusions; from a much enlarged spleen; from great accumulation of omental and parietal fat, and from pregnancy.

A careful examination and comparison, and a rigid system of exclusion will often be required to make the differential diagnosis. A diagnosis, when there is a single large ovarian cyst, without an accurate history may be impossible. But the ovarian disease first appears on one side of the lower abdomen, and it is not till later that it so much resembles ascites. From ordinary ovarian tumors it is distinguished chiefly by the more or less solidity and irregularity of the latter, and by the flanks being more sonorous on percussion when the patient lies upon the back. In ovarian and other tumors in the abdomen, serous effusions may take place into the peritoneal cavity, causing obscurity. In some cases a full diagnosis cannot be made until the fluid is evacuated. Obstructive disease of the liver, the heart, or the lungs, generally precedes ascites, and the history of the case and the concomitant conditions will throw light upon it.

Ascites is to be distinguished from peritonitis by the pain, tenderness, and other inflammatory symptoms accompanying the latter. An enlarged spleen commences from above, extends downward, is solid, its margin and outline can be felt, and the general symptoms will be different.

Omental and parietal fat will not present the same phenomena of fluctuation; in ascites the umbilicus will be projecting, while in parietal fat it is much depressed, and in omental fat it does not protrude.

Pregnancy is to be distinguished by its own particular signs, which will not here be described.

Prognosis.—The prognosis will depend upon the character of the original disease, of which the ascites is a symptom. That is usually of a severe and obstinate character, and ascites, therefore, is usually a grave affection.

Treatment.—As ascites is a symptom of other morbid conditions upon which it depends, its treatment, to a large extent, is merged into that of the original disease. There are certain indications, however, which the dropsy itself affords.

A dry diet persevered in will diminish the effusion, and will call upon the absorbents of the peritoneum to supply the needed fluid to the blood.

When the quantity of fluid is so great that its removal becomes an object, as sooner or later it generally does, there are good theoretical and practical reasons for increasing the discharge of fluid from the intestines, the kidneys, and the skin.

Cathartics which produce watery stools are most certain in their effects in reducing the quantity of fluid in the blood, and thereby promoting endosmosis of the dropsical fluid into the vessels, and its ultimate expulsion. When the intestines will tolerate their use, they should be given and pushed as far as they can well be borne by the general system.

Of these articles, elaterium is perhaps the most efficient. Given in doses of $\frac{1}{16}$ to $\frac{1}{8}$ of a grain of a good article, repeated at intervals of two or three hours, and suspended when purging commences, copious watery stools are produced, and generally without much irritation or depression. There are exceptions to this, and where this article disagrees, jalap and cream of tartar, or one of the saline cathartics may be used. These articles, however, not unfrequently fail to relieve the dropsical accumulation, and in other instances they rapidly reduce the strength of the patient, or produce much irritation of the bowels.

Diuretics sometimes operate quite efficiently, and in cases of debility or irritation of the bowels, and when the kidneys are not diseased, they should be tried before using the very active cathartics. Among the articles are mentioned juniper, broom, digitalis, squills, iodide of potassium, cream of tartar, and some other salines.

Various combinations are more efficient than any one article by itself. Fomentations, with infusions of digitalis, applied to the loins, when absorption by the stomach does not readily take place, are said often to be quite efficient.

Diaphoretics are sometimes useful, especially where neither the bowels will bear cathartics nor the kidneys diuretics. The most efficient of these articles is jaborandi or pilocarpin. Given in appropriate doses it produces free sweating, and often the dropsical accumulation is materially diminished. The warm bath, and particularly the steam bath, will aid in the diaphoretic effect.

But all these means often fail, or will reduce the strength of the patient more rapidly than they do the dropsical accumulation. The great palliative remedy is paracentesis. It may be resorted to too soon, and in inflammatory cases it is not without danger of increasing the inflammation. The uniform and constant pressure of the fluid may diminish materially the hyperæmia and check the rapidity of the effusion, and the exhausting effect of the disease may go on more rapidly after tapping. But when the accumulation is so great as seriously to interfere with respiration or other functions, and to produce great discomfort, the aspirator or trocar should be used. When the trocar is used, a small incision with a sharp lancet or bistoury may be made through the skin in the linea alba, between the pubes and the umbilicus, the trocar following.

Pressure should be kept up by a broad bandage around the abdomen, frequently tightened while the water is flowing away, and fastened snugly when the operation is completed. In cases where the abdominal walls are much attenuated, I have made the incision by the snap of a spring lancet, and introduced a common silver female catheter through the opening. The operation is very simple, is ordinarily almost entirely devoid of danger, and in non-inflammatory cases may often be resorted to early with the greatest propriety and advantage. In some cases after the tapping the accumulation does not reappear, in many more, however, it does, and in some very rapidly; but the operation should be repeated as often as the distention is distressing, and sometimes after many tappings the accumulations cease. Several American cases have been reported where tapping was practiced over one hundred times, and in one case one hundred and eighty times during ten years, with a cessation of the disease at the end of that time, the patient surviving for years afterward. I myself have tapped one patient ninety-two times within about four years, with at length a cessation of the accumulations. The case was in a female, where a peritonitis after an abortion was followed by dropsy. The urine was exceedingly scanty for the four years, and the ordinary diuretics had very little effect, and had for a long time been abandoned. Cathartics debilitated the patient without having any material effect upon the dropsy, and were also abandoned. The skin was habitually dry, and nearly all the fluid taken into the system was thrown out by the peritoneal surface, and its cavity was filled to its extremest extent generally in about two weeks, making the operation as often as that imperative. The patient, naturally a strong and vigorous person, and accustomed to active labor, was able to be up and to attend to her household affairs, excepting for a day or so at the time of each tapping.

When the effusion ceased, the patient had been partaking freely of water-melons and a decided diuresis followed. The disease did not and the tubercles have softened, and the ulcerative stage supervenes, little or nothing more can be hoped from the preparations of iodine; palliative and supporting treatment alone will be of use, and the character of the palliative measures will depend upon the particular symptoms.

In chronic peritonitis not tuberculous, the cause must be sought for and must influence the treatment. The inflammation must be checked by the means already indicated. In chronic cases opium cannot be relied upon as in acute cases, and the bowels should not long be kept constipated. They must, in fact, be kept open, and if serous accumulations take place, even the milder forms of hydragogue cathartics may be useful. Alteratives, eliminatives, and counter-irritation will be the most important agents in the treatment, and the particular selection will depend upon the special conditions in each case. The bitartrate of potash, given so as to act as a laxative and diuretic, other more stimulating diuretics when the kidneys will bear them, mercurials in moderate quantities not unfrequently, with such other remedies as the accompanying diseases may demand, should be used. Blisters and iodine liniments will often be useful. The iodide of potassium, here, as in other chronic inflammations with exudates, may be required.

The *chronic peritonitis* of *alcoholism*, commonly connected with disease of the liver and other parts, is but a link in the chain of evils which the poison has fastened upon its victim, and a fatal result is almost sure to follow. However, some of the means already indicated may be tried.

When such accumulation of fluid takes place in the abdomen as to interfere with respiration, and to produce great suffering, the fluid should be removed by paracentesis, though this operation in peritonitis should not be hastily resorted to. The bathing of the inflamed membrane in the fluid, and the gentle uniform pressure which it produces on the hyperæmic vessels may diminish the inflammatory action, and only when the symptoms caused by the pressure demand relief should tapping be performed.

ASCITES.—Abdominal Dropsy.

Ascites is an accumulation of serum within the peritoneal cavity, and this term, and especially that of abdominal dropsy, is commonly applied to such accumulations as are not caused by positive inflammation. There is, however, a modified action of the capillary vessels or lymphatics by which the balance between effusion and absorption is destroyed, the effusion greatly preponderating. This may be dependent upon some morbid process in the vessels of the peritoneal tissue; upon some obstruction and consequent congestion of the portal vessels; upon some cause disturbing the systemic circulation; or some change in the osmotic relations of the blood, and the fluid within the peritoneum.

More or less effusion of serum attends most cases of even acute peritonitis, as we have seen, and a more free quantity the chronic forms. When this is inconsiderable or temporary it does not take the name of ascites, and only when it becomes a predominating condition is it called abdominal dropsy.

Etiology.—Not only tubercle but cancer and other tumors within the abdomen cause serous accumulations; and the bursting of ovarian cysts or of hydatids may present a fluid within the peritoneal cavity.

The most characteristic form of ascites, where dropsy of the peritoneal cavity alone exists, is produced by obstructed circulation of the portal blood through the liver. This may be produced by direct pressure upon the portal trunks, by tumors, or hydatids; but it is more likely to be due to disease within the liver, involving the hepatic capillaries and the veins which open into and flow from them. The most common liver disease producing this effect is cirrhosis, or the "hobnail" or "gin liver," which produces its effect by a slow inflammation and contraction of the fibrous capsule of the vessels. Obstruction of portal circulation may be produced in what is called the nutmeg liver; and other degenerative processes in the organ may have to some extent the same effect.

In obstruction of the systemic circulation, as from organic disease of the heart or the lungs, dropsy of the abdomen may occur in connection with dropsy of other cavities and tissues. It may also be produced, as a feature of general dropsy, by disease of the kidneys, in which too little water is secreted, the albumen of the blood is lost, and urea is retained in the blood and tissues. By the accumulation of water in the system, by the thinning of the blood in the loss of albumen, and by the retention of urea irritating the fibrous tissues, effusion, endosmotic and irritative, occurs; and dropsy of the peritoneal cavity, as well as effusions elsewhere, follows.

Dropsy may result from obstructed circulation through the general capillaries; and the thinness of the blood which occurs in various cachexias and in simple anæmia may so change its osmotic relations as to cause dropsy of this cavity as of other parts. Finally, more than one of these causes, local or general, may be combined in the production of the effect.

but they seem mere varieties of encephaloid cancer, and there appears no necessity of regarding them otherwise than as soft cancer.

Of a malignant disease of the intestines, scirrhus is the most common form. As in the stomach, cancer of the intestines commonly occurs after the age of forty, and is marked by a train of symptoms at first not very definite, but resembling chronic inflammation or ulceration; but at length it is distinguishable by its history, its steady progress, and finally by the appearance of the cancerous cachexia, sometimes by intestinal obstructions, and more positively by the appearance of a tumor. There is sometimes a diarrhœa, but oftener constipation, and not unfrequently discharges of mucus and changed blood. When the cancer is situated in the rectum, at the sigmoid flexure of the colon, or more rarely elsewhere, stricture and final obstruction are apt to occur. In such cases the patient often succumbs before the breaking down or ulcerative process takes place.

Diagnosis.—The progress of the disease may be more or less rapid, but the result is always the same. The professional interest in these cases is chiefly in the diagnosis. This is to be made out by a careful observation of the history, by the persistent progress, and especially by the appearance of a constant and growing tumor, at least until ulceration occurs, when the tumor may possibly diminish; but then the discharges and the advanced condition of the cachexia can leave little doubt. In case of the occurrence of general symptoms, but where no tumor of the abdomen is observed, an examination per rectum must be made, when a tumor will often be discovered.

Treatment.—An epithelioma of the rectum may admit of an operation for its removal. Some successful cases are reported, but it is a desperate resort, and in the ordinary forms of scirrhus or cerebriform cancer the cases are hopeless.

The *treatment* of cancer of the intestines, except in the rare cases of epithelioma of the lower part of the rectum, is simply palliative. In case of constipation or obstruction, saline laxatives, to secure a fluid or semi-fluid condition of the fæces, may afford much relief and prolong life. Articles of food containing indigestible substances should be carefully avoided, and the general hygienic management of the patient should receive attention.

In one case of a medical gentleman, where from great obesity and the position and small size of the cancer no tumor could be felt, and a positive diagnosis was not made, acute intestinal obstruction occurred, and death in a few days. On *post-mortem* examination a firm cancerous tumor was found, not larger than a small-sized orange, near the sigmoid flexure of the colon, so firmly closing the intestine that only a common-sized catheter could be passed through the opening, and the immediate cause of the complete obstruction was the accumulation of a quantity of the seed capsules of apples at the point. These totally indigestible substances were too large to pass, and the most distressing consequences followed.

Where there is a tendency to constipation, attempts should be made to relieve the pain with belladonna or hyoscyamus before opium is resorted to; in extreme suffering the chloral hydrate or the inhalation of chloroform may be used; but in many cases the opiates will be more efficient and will finally be required. Morphine, or morphine and atropine hypodermically, will be most efficient.

Here, as in other cases of cancer, specific remedies—the Chian turpentine is at present most advised—may be tried when not of a character to do injury. They may be useful by affording the patient the satisfaction of knowing that something is being done, and by such trials a remedy may possibly some time be found. The cundurango has been thought, under competent professional observation, to have exerted a favorable influence upon cancerous disease, and some are still disposed to have confidence in its virtues. Its use may certainly be allowed.

INTESTINAL OBSTRUCTION.—ILEUS.—THE ILIAC PASSION.

Etiology.—Complete intestinal obstruction may be produced by a variety of conditions; from the contraction of false membrane after peritonitis, and from cancer, as we have just seen; from intussusception, or the slipping of one portion of intestine into another, like the inverted finger of a glove; by the strangulation of an internal hernia; by contraction of the cicatrices of old ulcerations; by intestinal and biliary calculi; by hardened fæcal matter and other foreign substances; by slipping through an aperture in the diaphragm, the omentum, or the ligaments of the liver, uterus, etc.; by attachments of the vermiform process including an intestine, and by other disorganizing diseases in the region of the cæcum; by twisting of the intestines, and by some other possible conditions. Indeed, paralysis of one portion of intestine from phlegmonous inflammation, and spasmodic contraction of the part below, may result in obstruction, in fæcal vomiting, and the symptoms described as the iliac passion.

Common external strangulated hernia produces the same general symptoms, but this belongs to the province of surgery.

Symptoms.—When *obstruction* and *strangulation* of a portion of intestine occur, a certain train of symptoms follows, whatever may be the special physical conditions. There will be a localized pain, increasing paroxysmally, suggestive of severe colic. A cathartic, if given, does not operate, or only the lower bowels are evacuated, and opiates fail to give complete relief. Vomiting soon comes on, of ingesta and bile at first, but at length of the contents of the intestines above the obstruction—of stercoraceous matter. The abdomen becomes tympanitic ; localized tenderness may generally be discovered ; the pulse becomes frequent and small ; the surface is cold, and there are usually clammy sweats ; a collapsed condition follows, and death takes place, sometimes within a few hours, but at other times not till after twelve or fourteen days, the average being less than a week. As in enteritis and peritonitis, the mind usually remains intact, at least until near the very last.

Diagnosis.—The making of a proper diagnosis is of the greatest importance. For the first few hours it is liable to be confounded with simple colic. Soon, however, the more fixed local character of the pain, its severity and obstinacy, and the appearance of tenderness will point to obstruction and strangulation. The fæcal vomiting which follows will be still more conclusive, and the collapse, which may soon come on, will remove doubt.

In all cases an external hernia must be sought for, whether the attention is directed to it or not, and sometimes one unsuspected by the patient may be found. This has been illustrated in my own experience. Its practical importance will at once be seen.

Obstruction from other causes should be distinguished from that produced by intestinal and peritoneal inflammation, such as has already been described, though the importance of diagnosis in reference to treatment is not great. It may possibly be confounded with the effects of corrosive poisons, though the circumstances of the case and the special symptoms should lead to a ready distinction.

It is often impossible to determine the particular physical condition causing the obstruction or strangulation, and sometimes the symptoms of mechanical strangulation are closely simulated by functional derangements and obstructions.

It is also sometimes impossible to ascertain with anything like precision the portion of the intestine obstructed. A judgment may, however, be formed by closely observing the phenomena. If the obstruction is near the sigmoid flexure, the fæcal evacuations immediately after the attack will be small, or only such as may be in the rectum at the time. The situation of the pain and the point of the greater tenderness, and the distention of the colon, as discovered by palpation and percussion, will aid in localizing the difficulty.

If this be at the ileum or cæcum, there will be likely to be more abundant dejections at first, and the limitation of the distention to the small intestines. If situated still higher up, the vomiting will be less in quantity, but will sooner come on; the distention will be less, and the urine scanty from less absorption of fluids.

When the obstruction is caused by intussusception, the diagnosis as to the fact and the locality can often be made out with much certainty and considerable precision.

Intussusception of the intestine is not very unfrequent, especially in young subjects, and the cases are not as hopeless as in many of the other varieties of obstruction.

An invaginated intestine does not necessarily become incarcerated and strangulated. If this does not occur, it often cannot be distinguished. It is probable, however, that invagination sometimes takes place, and the intestine becomes restored without serious consequences. When obstruction and strangulation result, the symptoms are decided and sometimes are characteristic. A large proportion of cases are in children, but no period of life is exempt. The statistics show that more males than females suffer from this accident. In more than half of the cases the invagination is situated at the junction of the ileum and cæcum—a portion of the ileum descending into the cæcum through the ileo-cæcal opening, or rather the lips of the ileo-cæcal orifice descend into the cæcum, carrying with them more or less of the ileum, forming the internal tube or layer, and then a considerable portion of the colon may become inverted. The next most frequent point is the sigmoid flexure of the colon, the small intestine being very seldom invaginated.

In this accident, wherever occurring, the symptoms usually come on suddenly and without premonition, and not unfrequently with a sensation of slipping or of a peculiar motion in the part. Soon severe colic pains occur, and vomiting, tympanitis, a frequent and feeble pulse, with coldness of the surface and great depression, and all the usual symptoms of obstruction and strangulation already described appear. The fatal termination, which is the most common result, may, as in the other forms of ileus, be from collapse within a few hours, or not till after a week or more. One of the most characteristic symptoms is a discharge of bloody mucus, or sometimes more clear blood, after such sudden attacks of pain, and where hemorrhoids and polypi, and an attack of dysentery are excluded. The discharge of bloody mucus, and a tenesmic straining which may occur, especially when the intussusception is low in the colon and involves the rectum, may readily without care be mistaken for dysentery. The suddenness and violence of the attack, the positive constipation of the bowels after the first discharges, and the stercoraceous vomiting and early collapse, will serve to distinguish this state from dysentery. As an early diagnosis is important, in all cases of suspicion or doubt a digital or specular examination of the rectum should be made, and often the inverted intestine will be felt or seen. Another test, where the obstruction is low, is an inability to inject much fluid into the rectum without its forcible return.

When the invagination is at the ileo-cæcal junction, or in other parts of the colon, a tumor can often be felt by external palpation. It will usually be elongated, resisting and tender on pressure, and, of course, of recent origin, and more or less sudden in occurrence. The enlargement may extend from the cæcum to the transverse colon, or it may be altogether situated in any limited portion of the intestine. Occurring at the ileo-cæcal junction, the strangulation is often not complete, the shock may not be great, vomiting may be deferred, tenderness may for a considerable time be absent, and the case is likely to be more protracted. Indeed, intussusception may occur not only without complete strangulation, but without complete obstruction of the passage of fæcal matter, and the diagnosis, at least for some time, will then be obscure. In such cases, which, however, are rare, the difficulty may possibly continue for a long time.

The cause of the descent of a portion of the bowel into that which immediately succeeds and is continuous with it would seem to be a comparative relaxation of the lower part, into which the upper part passes, and a comparative contraction of this upper part which passes down.

As the result of this, three successive layers of the tube lie concentrically, so that an instrument passed from without into the inner cavity would penetrate three intestinal walls, two mucous surfaces and two peritoneal surfaces being in contact, with another peritoneal surface over all, and another mucous surface internal to all. Besides this, by the descent of the inner portion the mesentery attached is drawn in, and the compression and obstructed venous circulation cause congestion and more or less thickening of all these parts, and a greater or less degree of obstruction in the passage of the intestinal contents. This, sometimes complete, at other times is only partial; and the effects following will be influenced by the degree of this obstruction.

The obstruction of the circulation produces the condition called strangulation. The parts, when thus generally affected, become dark and swollen, the mucous and muscular coats nearly black, and the peritoneal coat of a slate color; and when this continues for any considerable time sphacelation takes place. Frequently mucus and blood escape from the intensely congested mucous surface, causing the discharge before referred to.

In cases where death of the part and the patient does not soon occur, a decided inflammatory action is set up; coagulable lymph is poured out upon the serous surfaces, increasing the swelling, and often agglutinating those surfaces together. The length of intestine involved in this invagination varies from a few inches to a few feet.

If the patient survives a sufficient time, other changes follow. The inflammation may extend, and a general peritonitis result. In other cases the invagination continues to progress; sometimes ulcerative processes in the mucous membrane occur, and may penetrate all the coats. The most important event is the sloughing and separation of the strangulated portion of intestine. If firm adhesions have formed between the serous surfaces, as may sometimes, fortunately, be the case, the necrosed portion may be separated and discharged, and the patient recover.

Too often, however, when sloughing occurs, fæcal matter passes into the peritoneal cavity, and in consequence increases, but soon terminates, the sufferings of the patient. The discharge of the sphacelated blood more commonly occurs in from twenty to thirty days, though it may be considerably sooner or much later. The results of separation are favorable, it is said, in about half of the cases; while death, in the majority of instances in this disease, is produced by the shock of the strangulation, by the occurrence of diffused inflammation, or by the consequences of the obstruction.

When death occurs from the shock, it is usually not long delayed. When from inflammation, it is within a week or ten days from the first severe inflammatory symptoms; and when from intestinal obstruction, the locality of the obstruction will have much influence upon the continuance of life. If the obstruction be low in the intestines, and neither strangulation nor inflammation occurs, the patient, with proper care as to food, may survive several weeks, or even some months; but the nearer the obstruction is to the stomach, the sooner, if unrelieved, will fatal results follow. From these statements it will be seen that the prognosis is exceedingly grave, but still that a recent case will not be without hope.

Treatment of Ileus.—In the treatment of intestinal obstruction and strangulation reference must be had to what we know or judge to be the cause, as well as to the particular symptoms present. Whenever symptoms of obstruction are accompanied by those of inflammation, unless the cause can be reached by some direct mechanical measures, the treatment must be the same as that advised for phlegmonous enteritis, or for local or general peritonitis. *Purgatives must be avoided,* opium must be given in free doses, and the parts kept at rest, with such other antiphlogistic and antipyretic remedies as acute inflammations demand. Food must be given in small quantities, and in a very digestible and liquid form, and all other details elsewhere described as proper in intestinal and peritoneal inflammations must be followed.

The practice of giving powerful and repeated doses of cathartic medicines to overcome such mechanical obstructions as have been described, must on reflection, to any one understanding the pathology, appear not only useless, but injurious. Constipation arising from a sluggish state of the bowels, with ordinary accumulations, calls for purgatives, and may require those of an active kind; but mechanical obstructions are apt to be increased rather than relieved by exciting peristaltic action, and certainly if the obstruction be not overcome, irritation, inflammation, and suffering will be increased.

It is sad to know that in so severe a case so little can be done; but it is sadder to do in blindness and ignorance what will increase the suffering and danger, and hasten a fatal result.

Enemas may be tried; and in some cases the administration of salines in sufficient doses to liquefy the intestinal contents, and thus promote their passage through restricted openings, without powerfully exciting peristaltic action, may be followed by relief; but if there is complete obstruction, these will be useless, and if inflammation is present and decided, it will be likely to be increased. But when reasonable quantities fail of effect, or the evidences of complete mechanical obstruction become more conclusive, or strangulation and inflammation occur, all laxative remedies must be excluded.

The only, or at least the principal, cases where saline laxatives should be ventured upon is where occlusion of the intestine is supposed not to be complete, and severe strangulation is not present, as in case of a cancerous tumor leaving a small passage, or where bands of false membrane or contracting cicatrices have left a small opening and have caused irritation, etc. In doubtful cases free quantities of water may be taken by the stomach, and simple enemas may be used.

When intussusception is the cause of obstruction, the same directions as to the use of cathartics and other general means will apply.

Liquefying the intestinal contents may promote passages where the obstruction is not complete, but increasing peristaltic action would tend to increase the invagination and excite inflammation. As an almost absolute rule, therefore, cathartics must be avoided. Cases of intussusception have terminated spontaneously, but the probabilities are so remote as not to be taken into the account in the management of the disease.

In the treatment of these cases two objects are to be aimed at: *first,* to restore, if possible, the invaginated intestine to its proper state; and *second,* if that be impossible, to counteract severe inflammation, aid the patient to endure the suffering, and also to promote adhesion of the peritoneal surfaces of the invaginated intestine, at the point where it commences, and to aid, if possible, the separation by sloughing of the strangulated portion, so as to leave a pervious canal. In what manner and to what extent can these objects be promoted?

As soon as the diagnosis is positively or even proximately established, efforts should be made to push back the invaginated intestine by pressure from below by means of water or air thrown up, in as free quantity as is possible or safe, into the rectum and colon.

The abdomen should be kneaded during and after the injection, and the effect may be materially aided by reversing the position of the body—supporting the patient for a time with the pelvis higher than the chest. The prospect of success is not great, and is diminished by the length of time the displacement continues; but the effort should be faithfully made. Too great force with the injections of air or water should not be used, as the intestine may be seriously injured or ruptured.

If, from the length of time the difficulty has continued, there is reason to suppose that gangrene has taken place, for obvious reasons the injections *must not be used;* and before their use, when determined upon, the lower bowels should be cleared of their fæcal contents by enemas. Atmospheric air, carbonic acid gas, or simple water may be used with this hope of restoration.

If this method fails after a fair trial (and some risk of doing harm by it may properly be run), the propriety of making an abdominal section and pulling out the invaginated intestine with the fingers must be considered. This has sometimes been successful, but there are serious objections to its performance. In the *first* place, there is danger in the operation from shock, from hemorrhage, and especially from inflammation. Secondly, by the time the diagnosis is fully established and the other efforts with the injections have been made, and failed, the feasibility of restoration has usually become doubtful. Adhesions may have been formed which had better not be disturbed, or gangrene may have taken place which it would be dangerous to meddle with, or the process of cure by separation and adhesion might be prevented.

If, however, the diagnosis is early and clearly made, and the effort at reduction by the means described has been early tried and has failed, and all this before much inflammation is established, before adhesions are formed or gangrene has occurred, there would be a reasonable prospect of the success of the operation; and in careful and well-trained hands it may not only be justified but called for. Out of twenty reported cases which have been tabulated, seven have been successful, but there have probably been other unsuccessful cases that have not been reported. This is the case in many operations, and such statistics must be received with some allowance. Prof. Sands, of New York, reports a case in detail, in an infant six months old, where the operation, performed eighteen hours after the attack, was successful. The intussusception was at the ileo-cæcal junction.

The success of the operation, as Prof. Flint remarks,* depends on its early performance. He thinks it will, in all probability, not prove successful if delayed over twenty-four hours after the occurrence of symptoms denoting the accident. It would seem to be more admissible in infants than in older subjects, as there would be little or no hope of a cure being effected in them by the sloughing process, while in older subjects more hope of this may be entertained. In deciding as to an operation all these conditions must be considered, and here, as everywhere, the judgment of the practitioner must determine.

It is perhaps unnecessary to repeat—but in view of the temptation, when constipation exists, to resort to purgatives, it cannot be too strongly enforced—that cathartics must tend to increase the invagination, and, later, to break up adhesions and destroy the chances of spontaneous cure. Where the fact of intussusception is established, with its consequent obstruction, cathartics of every kind are positively contra-indicated; and in doubtful cases, where it may be supposed that irritation and spasmodic action of the intestines are producing the pain and constipation, it is, as a rule, far better to allay that irritation and spasm by anodynes, the warm bath, fomentations, etc., than to give cathartics with the view of removing irritating matters. Until spasm is overcome, cathartics are likely to fail to operate, and, when failing, must add to the irritation. Constipation may continue for days, and, in many cases, even for weeks, without serious consequences; and a restless anxiety to "move the bowels" is uncalled for. Their proper movement, to be sure, is an evidence of an improved condition, and is generally accompanied with relief; but this does not prove that efforts at procuring movements by cathartics will be useful. At all events, in intestinal invagination they are dangerous, and must not be given. On the contrary, measures to quiet peristaltic movements are important. Opiates, in doses sufficient to relieve pain, keep the parts at rest, and check the intensity and the spreading of the inflammation, are the chief agents to be relied upon for promoting the second object of treatment—the favoring of adhesions and cure by sloughing.

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* Vide Flint's Clin. Med., p. 324.

It is true that success is very doubtful; but when no other course promises so much, this is the one to be pursued. It must be steadily continued, as in the severe abdominal inflammations which have already been described. Spanæmics are to be avoided; nourishing articles of food leaving as little residuum as possible are to be given; the patient is to be kept absolutely quiet; the soothing effect of warm applications to the abdomen is to be obtained; and the patient is to be sustained by tonic doses of quinine and by other agents, as the symptoms may require.

In obstruction and strangulation, with symptoms of the "iliac passion" from other causes than intussusception, operative procedures—laparotomy—may be demanded. If there is reason to suspect internal hernia, or if there be a hernial sac, or any hint of such obstruction, the patient should not be allowed to die without an effort at surgical relief. When the seat of the obstruction is detectable, and especially if in the lower part of the intestines, the operation for the formation of an artificial anus, either at or above the point of obstruction, may be called for. Even where the location is doubtful, but obstruction and strangulation are certain, an exploratory operation, though unfortunately generally unsuccessful, may give the patient a last chance. Such cases come into the province of surgery, and need no farther discussion here.

In all cases of obstruction where tympanitis is excessive, the application of ice to the abdomen, in accordance with Jaccoud's recommendation,* may perhaps be tried; but if unsuccessful, the intestine may be punctured through the abdominal walls by means of a very fine trocar, or the fine needle of an aspirator, or of a hypodermic syringe, and the gas allowed to escape. This operation is generally harmless, and may procure very great relief.

Obstructions of the intestines without strangulation have already been referred to. These may be organic or functional, permanent or temporary, and the organic causes may be seated outside of the intestinal walls, within their substance, or within the canal. These causes may act by compression, contraction, or impaction, and the obstruction may be complete or incomplete.

Functional obstructions may be from paralysis, spasm, inverted or otherwise deranged peristaltic action. These functional obstructions, when dependent upon deficient peristalsis, or upon accumulations, as from impacted fæces or indigestible ingesta, such as chalk, slate, stones, fruit seeds, etc., may often be completely overcome by the use of cathartics. If dependent upon spasm, an antispasmodic, a warm bath, or an opiate may be successful, followed by enemas, or laxatives, etc. If dependent upon more serious *structural changes*, these means will fail, or produce only temporary relief. These latter changes usually come on slowly, are of course persistent, and their character must be judged of by the history of the case, the previous diseases, and all the phenomena presented.

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* Reference to last edition.

When complete occlusion occurs, in a greater or less time serious effects will follow. Distention from fæcal matter and from gases will take place, and pain, vomiting, etc., come on—the sooner the higher up the obstruction.

Digestion will be impaired, debility and emaciation will follow, local inflammations and ulcerations are apt to result, and perforation with all its consequences may terminate the case. Sooner or later, without some operative procedure, which, however, promises little, the patient will succumb, if not from other accidents from exhaustion and asthenia.

If the obstruction does not amount to occlusion, but only to embarrassed movements, by care as to diet and keeping the bowels soluble, it may be tolerated indefinitely.

The *treatment* of these cases of strictured bowels, as already intimated, will consist in giving food that has no indigestible and insoluble particles, and in keeping the fæcal matters above the obstruction in a liquid or softened condition.

Vegetables which contain woody fibre, seeds, stones, rinds, seed capsules, etc., must not be allowed. The gristle, bone, skin, and fascia of meats must be excluded. Milk with lime-water, or thickened with thoroughly cooked and perfectly soluble farinaceous matter, strong broths, and the tenderest meats, thoroughly masticated, must constitute the food. The fæcal matter must be made soluble by saline laxatives ; but active purgatives must be scrupulously avoided, as tending to produce irritation and serious mischief. Large draughts of simple water, or with the addition of a little table-salt, may sometimes answer the purpose, if taken on an empty stomach, of keeping the fæces soluble.

In progressive cases where the obstruction becomes complete, or so nearly so as to be no longer tolerated, the only resource is colotomy, or opening the intestine and forming an artificial anus. This operation is applicable where the obstruction is in the rectum, at the sigmoid flexure, or transverse colon, and is less dangerous than was formerly supposed. The standard works on surgery give the particulars of this procedure.

Strictures of the rectum and lower part of the colon sometimes admit of another remedial measure—of mechanical dilatation.

When stricture occurs from contraction of cicatrices after ulcerative dysentery, from bands of false membrane, or other similar causes, the solid fæcal discharges will take a flattened or slender form, and constipation is generally produced. There will be pain, a sense of fullness in the part, straining at stool, etc. If, on examination, a structure is found within reach, an attempt may be cautiously made to dilate it by a graduated bougie. By means of different-sized balls on a flexible rod of whalebone, not only the calibre of the stricture can be ascertained, but, as in the case of the œsophagus, its longitudinal extent also. Proceeding on the same principle as in stricture of the œsophagus or the urethra, cone-shaped rectal bougies adapted to the condition of the part may be introduced from time to time, or sponge tents of proper sizes may be used, repeated as may be required and borne; and in this way the greatest amount of relief may sometimes be obtained.

FUNCTIONAL DISEASES OF THE INTESTINES.

Under this title are usually considered enteralgia, colic, and many cases of diarrhœa and constipation.

Some account was given of enteralgia in connection with gastralgia; and as the causes and condition of the two affections are so similar, and they are so frequently combined, a separate consideration of the latter is hardly required. Besides, it is a part of the general subject of Neuralgia, which will be discussed in a different connection.

Intestinal colic is a more distinctive affection, and requires a more particular description. It consists of a severe twisting pain, mostly in the umbilical region, but without inflammation, and independent of serious organic or structural disease. It is generally accompanied by constipation, but sometimes by looseness of the bowels, and is intermitting or distinctly remitting. The dividing lines between what are called colic and enteralgia on the one hand, and intestinal catarrh on the other, are not always positively or distinctly drawn; and yet the pain of colic is usually produced by some local irritating material in the intestines, while intestinal neuralgia or enteralgia is not; and intestinal catarrh is an inflammation, though sometimes a remedies as acute inflammations demand. Food must be given in small quantities, and in a very digestible and liquid form, and all other details elsewhere described as proper in intestinal and peritoneal inflammations must be followed.

The practice of giving powerful and repeated doses of cathartic medicines to overcome such mechanical obstructions as have been described, must on reflection, to any one understanding the pathology, appear not only useless, but injurious. Constipation arising from a sluggish state of the bowels, with ordinary accumulations, calls for purgatives, and may require those of an active kind; but mechanical obstructions are apt to be increased rather than relieved by exciting peristaltic action, and certainly if the obstruction be not overcome, irritation, inflammation, and suffering will be increased.

It is sad to know that in so severe a case so little can be done; but it is sadder to do in blindness and ignorance what will increase the suffering and danger, and hasten a fatal result.

Enemas may be tried; and in some cases the administration of salines in sufficient doses to liquefy the intestinal contents, and thus promote their passage through restricted openings, without powerfully exciting peristaltic action, may be followed by relief; but if there is complete obstruction, these will be useless, and if inflammation is present and decided, it will be likely to be increased. But when reasonable quantities fail of effect, or the evidences of complete mechanical obstruction become more conclusive, or strangulation and inflammation occur, all laxative remedies must be excluded.

The only, or at least the principal, cases where saline laxatives should be ventured upon is where occlusion of the intestine is supposed not to be complete, and severe strangulation is not present, as in case of a cancerous tumor leaving a small passage, or where bands of false membrane or contracting cicatrices have left a small opening and have caused irritation, etc. In doubtful cases free quantities of water may be taken by the stomach, and simple enemas may be used.

When intussusception is the cause of obstruction, the same directions as to the use of cathartics and other general means will apply.

Liquefying the intestinal contents may promote passages where the obstruction is not complete, but increasing peristaltic action would tend to increase the invagination and excite inflammation. As an almost absolute rule, therefore, cathartics must be avoided. Cases of intussusception have terminated spontaneously, but the probabilities are so remote as not to be taken into the account in the management of the disease.

In the treatment of these cases two objects are to be aimed at: *first*, to restore, if possible, the invaginated intestine to its proper state; and *second,* if that be impossible, to counteract severe inflammation, aid the patient to endure the suffering, and also to promote adhesion of the peritoneal surfaces of the invaginated intestine, at the point where it commences, and to aid, if possible, the separation by sloughing of the strangulated portion, so as to leave a pervious canal. In what manner and to what extent can these objects be promoted?

As soon as the diagnosis is positively or even proximately established, efforts should be made to push back the invaginated intestine by pressure from below by means of water or air thrown up, in as free quantity as is possible or safe, into the rectum and colon.

The abdomen should be kneaded during and after the injection, and the effect may be materially aided by reversing the position of the body—supporting the patient for a time with the pelvis higher than the chest. The prospect of success is not great, and is diminished by the length of time the displacement continues; but the effort should be faithfully made. Too great force with the injections of air or water should not be used, as the intestine may be seriously injured or ruptured.

If, from the length of time the difficulty has continued, there is reason to suppose that gangrene has taken place, for obvious reasons the injections *must not be used;* and before their use, when determined upon, the lower bowels should be cleared of their fæcal contents by enemas. Atmospheric air, carbonic acid gas, or simple water may be used with this hope of restoration.

If this method fails after a fair trial (and some risk of doing harm by it may properly be run), the propriety of making an abdominal section and pulling out the invaginated intestine with the fingers must be considered. This has sometimes been successful, but there are serious objections to its performance. In the *first* place, there is danger in the operation from shock, from hemorrhage, and especially from inflammation. Secondly, by the time the diagnosis is fully established and the other efforts with the injections have been made, and failed, the feasibility of restoration has usually become doubtful. Adhesions may have been formed which had better not be disturbed, or gangrene may have taken place which it would be dangerous to meddle with, or the process of cure by separation and adhesion might be prevented.

If, however, the diagnosis is early and clearly made, and the effort at reduction by the means described has been early tried and has failed, and all this before much inflammation is established, before adhesions are formed or gangrene has occurred, there would be a reasonable prospect of the success of the operation; and in careful the poison in the vomited matter, or in the stomach and bowels *post mortem*, will determine the diagnosis.

Strangulated hernia is to be distinguished from colic by the history of the case, the presence of a tumor, the fixed and local seat of the pain, the tenderness which will soon be developed, and the stercoraceous vomiting as the case advances.

The characteristics of the various forms of intestinal obstruction and strangulation the reader is supposed to have just studied in the preceding pages, and these are referred to.

In the more purely neuralgic cases the attacks are apt to be repeated at somewhat regular intervals, there is no distention from gases, and they are usually independent of the taking of ingesta. In hysterical cases the abundant pale urine and the variable emotions will be characteristic.

Great care is necessary in all cases of severe pain in the bowels to come to correct conclusions as to its character; as in no cases are mistakes more likely to occur to the superficial observer, and in none are mistakes of a more serious character.

Prognosis.—The prognosis in colic is favorable when the diagnosis is clearly made. Severe pain in the bowels, however, always requires serious attention, as that which apparently commences as a colic may result in an inflammation, or prove indicative of serious obstruction.

In the common accidental cases it is usually of short duration; and the youth who is writhing in agony and alarm, and praying for relief to-day, may forget his fears and be as reckless and profane as ever to-morrow.

There are some cases, however, which become habitual in their occasional return. Some are almost entirely neuropathic in character and others are connected with perverted intestinal secretions.

Severe pains of a colicky character are sometimes associated with perverted secretions of the mucous follicles, and the production and discharge of balls of albuminous matter. These cases require treatment with reference to changing the condition of the follicles; and for this purpose the preparations of turpentine are thought to be particularly useful.

Treatment.—In the treatment of colic the causal indication must be observed.

The indications are to remove whatever irritating materials may be present producing the effect, and to allay the pain and spasms.

Very frequently, it may be said generally, the second-named indication requires to be fulfilled first in time.

In gastralgia from irritating materials in the stomach an emetic which will operate speedily will often be the first and the only remedy required.

In intestinal colic the offending materials cannot be so hastily disposed of. The spasmodic action of the intestines may delay or prevent the operation of cathartics ; and the indication first in time is to overcome the intestinal spasms and relieve the pain.

This can sometimes be accomplished by heat applied over the abdomen and to the extremities, by warm and aromatic drinks, such as mint, anise-seed, or ginger tea, etc., or spts. of camphor and water, or warm spts. and water. A dose of sulph. ether or of chloroform by the stomach, or if the pain be very great ether or chloroform by inhalation, until sufficient anæsthetic effect is produced to arrest the pain, will often give very speedy relief.

Heat to the abdomen may be applied by flannel cloths wrung out of water as hot as can be borne, and the temperature may be kept up by covering the cloths with relays of dinner plates, taken out of boiling water. But the most certain and permanently effectual anodyne is morphine, or some of the other preparations of opium. Free doses will be borne, and sometimes large doses will be required to quiet the pain.

If the pain is very great, an opiate may be given, and immediately after chloroform or ether may be inhaled for immediate effect, and by the time this abates the opiate will have had time to produce its action. The morphine may be placed upon the tongue, or often, better still, it may be given hypodermically and as in other cases may be combined with atropia.

A warm sinapism, or cloths sprinkled with turpentine placed over the abdomen, and hot plates over those, will often be more efficient than the heat and moisture alone. A warm pediluvium, or a general warm bath, will frequently aid in procuring relief.

After the pain and spasm are overcome, a purgative will generally be needed. Its operation will expel irritating materials—gaseous, liquid, or solid—and the attack will thus usually be ended.

A free dose of castor-oil, to which may be added half a drachm, more or less, of oil of turpentine—the two intimately mixed and given upon some warm fluid, such as mint tea or hot coffee (which latter goes far toward concealing the taste of the oil), will usually soon operate, notwithstanding the free doses of morphine that may have been given.

Whenever an acid is suspected an alkali should be given, at whatever stage of the treatment, either with the anodynes or with the cathartics. A saline cathartic with an alkali will often answer the purpose. More efficient, and comparatively unirritating, will be an infusion of senna leaves and anise-seed, to which are added sulphate of magnesia and carbonate of soda. ℞ Sennæ Fol., ℥ss; Sem. Anise, ʒjss; Boiling Water, ℥viij or ℥x. Infuse for half an hour in a covered vessel, pour off the tea, and add Sulp. Magnesia, ʒvj; Carb. of Soda, ʒj, for a draught.

Jalap and cream of tartar—any decided but unirritating cathartic, aided if necessary by enemas—may be given to relieve the bowels of any irritating materials. If the secretions are particularly deranged, a mercurial may precede or be added to the cathartic portion.

In the colics of hysteria a mixture of Hoffman's anodyne and fluid extract of valerian, or the valerianate of ammonia, or, sometimes better still, assafœtida by the stomach or by enema, will be effectual and safer than repeated recourse to opiates. The bromide of potassium, in various combinations, is also a remedy often useful in hysterical cases; and in the flatulent colic of infants a few grains of the bromide in an infusion of anise-seed, repeated until relief is obtained, is often efficient, and safer than opiates. Soot tea, when open chimneys were more common, was formerly a domestic remedy for the colic of children, and the creosote, which it often contained, tended to arrest fermentative processes and relieve the pain.

When repeated attacks of colic occur, the cause should be carefully sought for and removed. These attacks often depend upon indigestion, and may merge into intestinal catarrh. The dyspepsia in such cases must receive attention. When it results from improper food this cause must be avoided, and so of all other causes.

Whatever may the special cause of the attack—improper ingesta, flatulency, acidity, vitiated bile, or other foul secretions—the same general principles apply. First allay the pain and spasm, and then evacuate any irritating materials; and in all habitual, and repeated attacks the cause must be specially looked for and removed.

If, after spasmodic pain is quieted, and proper evacuations are effected, the pain remains and becomes more constant, intestinal catarrh or some form of inflammation should be suspected, and will usually be discovered. The treatment must then be adapted to this state of things.

LEAD COLIC.—COLICA PICTONUM.

This is a particular kind of colic dependent upon a special cause.

Causes.—It is produced by lead poisoning, and occurs in connection with other symptoms, with a peculiar anæmia and debility, with various nervous disorders and pains, and often with paralysis of the extensor muscles of the wrist, producing the "dropped hand." The lead is usually introduced into the system slowly, in small and repeated quantities, and its sources are various.

It seems to have derived the name of colica pictonum from its former great prevalence in Poictou, where lead was habitually added to wine; it prevailed in the West Indies, where leaden worms were used in distilling rum; and in Devonshire, England, where leaden vessels were used in connection with the manufacture of cider.

It is occasionally produced in this country by the storage of drinking water in leaden vessels, or by conducting it through leaden pipes; and the softer the water, the less lime it contains, the more it acts upon the pipes, and the more likely it is to be contaminated with the lead. Lead poisoning is also produced by the use of beer or cider drawn through leaden faucets, by taking preserves or pickles kept in earthen vessels glazed with compounds of lead, and by the use of certain cosmetics and hair-dyes, composed in part of salts of lead; and also in snuff-takers, by the lead mingled with that absurd errhine.

The poisoning is more common, however, among workers in lead, among manufacturers of lead paint, and among painters; and sometimes it occurs in printers, from constantly handling type composed in part of lead. It may be produced by sleeping in a room newly painted, the evaporation of the turpentine in the paint carrying small particles of the lead into the air which is inhaled.

It is occasionally produced by the use of preparations of lead as medicines, either internally or as outward applications; and although I am unable to call to mind a single case in my own experience where this has been the source of the poisoning, yet it should be borne in mind that not only lead but other substances used as medicines may act as poisons; and that some persons, from causes we do not understand, are much more susceptible to the poisonous action of various substances, including lead, than others. It should also be remembered that some resist for a long time the action of some poisons, such as lead, mercury, arsenic, opium, tobacco, and alcohol, which in the same or in far less quantities will seriously injure the average individual, and that inferences of the innocuousness of articles from their use with impunity in certain cases are entirely unreliable and unsafe as bases of action.

The form of lead most likely to produce poisonous effects is the carbonate, the common white paint; and workers in this should be particularly careful not to take it in their food, not to allow it to remain in connection with the surface—under their nails or elsewhere—and should be careful not to inhale the powder likely to arise in the air when it is handled in the dry state. Grinding the lead in water or oil, instead of in the dry state, is said to have diminished materially the occurrence of lead poisoning in workers in lead manufactories.

The effect of this poison, when slowly introduced into the system in the usual way, is commonly first manifested in a pallor of the countenance, or a sallow, earthy look, in more or less general failure of health, in loss of appetite often, in thirst, and sometimes in a sweetish taste in the mouth. Neuralgic pains and a sense of uneasiness are experienced ; and in those disposed to gout, the symptoms of the two affections are frequently mingled.

Chronic albuminuria is said not unfrequently to occur in those who have been subject to the influence of lead.

Diagnosis.—One diagnostic mark of the poison of lead, which has been made much of within some years past, is the formation of a blue line along the edges of the gums as they join the teeth. This, however, is not always marked or present at all in lead poisoning, it varies in distinctness when present, modified by the amount of tartar upon the teeth, and is, moreover, produced by other causes, by impregnation of the system with copper and some other metallic substances. The most important and characteristic effects of the lead poison are the attacks of colic and a peculiar paralyzing action upon the nervous system.

Lead colic usually comes on rather gradually, the pains not materially differing from other forms of colic, and is accompanied by obstinate constipation and often by vomiting. The pains appear to be due to a more or less paralyzed condition of portions of the muscles of the intestines, and the intense and irregular contraction of others. The regular proper peristaltic action of the bowels, which moves on and expels their contents, is interfered with, and this irregular painful action takes its place. The paroxysmal character of the intense pain is marked, but when the disease is fully established there is a duller pain, or a decided sense of uneasiness between the paroxysms. The pain is commonly more intense in the umbilical region, but is generally more or less diffused and shifting—is not commonly aggravated, but often rather relieved, by pressure and friction, and the abdominal walls are usually retracted and tense. The vomiting may be early and sympathetic, or it may come on later, as the result of intestinal obstruction.

Prognosis and General Phenomena.—Lead colic rarely proves fatal of itself, and the paroxysms subside, sometimes after a day or two, in other cases not till after several days, and with remissions they may continue longer. When one attack has occurred, unless exposure to the cause ceases, and the lead is eliminated from the system, other attacks sooner or later are almost sure to follow.

Fortunately the colic is rarely attended with fever, or by a distinct development of intestinal inflammation.

The nervous disorders manifested in other directions are less paroxysmal and more continuous than the colic; but still many of them are very variable in their severity at different times. Various neuralgias and muscular paralyses, pain in the back and lower extremities, a sense of stricture about the body, the imperfect action of different muscles, etc., may occur, but the most frequent and most peculiar effect is the paralysis of the muscles supplied by the musculo-spiral nerve, and mainly its posterior osseous branch. The particular muscles most liable to be affected are, according to Duchenne, the extensor communis digitorum, extensor indicis, extensor minimi digiti, extensor secundi internodii pollicis, extensor carpi radialis brevior, extensor carpi radialis longior, extensor carpi ulnaris, extensor ossis metacarpi pollicis, and extensor primi internodii pollicis.

The paralysis of these muscles (and others are enfeebled but seldom distinctly paralyzed) causes a peculiar dropping of the hand from the wrist joint. This may come on suddenly or gradually; it is sometimes confined to one hand, usually the right, but it oftener affects both, though seldom equally. The paralyzed muscles waste rapidly, increasing the deformity; and while retaining their electro-sensibility, lose more or less completely their faradic contractility. There is no impairment of cutaneous sensibility; but there is apt to be pain and tenderness in the situation of the affected muscles during the acute stage of this peculiar affection.

Other muscles of the upper extremity, especially the deltoid and triceps, are sometimes but much more rarely affected, and in a similar way, by loss of power and faradic susceptibility, and by wasting. Sometimes the muscles of the lower extremities are affected, particularly the extensors of the foot and the leg; and occasionally the intercostal muscles and the diaphragm suffer. In exceedingly rare cases a large portion of the voluntary muscles are simultaneously affected, but in such instances it may be that some other element of disease is present than that produced by the lead. The duration of lead palsy is very various, extending from weeks to years. After relief it is liable to recur like the colic; and attacks of the latter usually precede the paralysis.

Epileptic or epileptiform attacks, coma, and other cerebral symptoms sometimes come on in the course of lead poisoning.

The longer symptoms of lead poisoning have continued, the more unfavorable the prognosis; and the affection, when thoroughly established, is apt to be, in some of its consequences, permanent.

Lead, when received into the system, is eliminated by various emunctories, and with greater or less facility in different cases. A portion of it, however, is apt to be retained and to be deposited in various positions, in contact or in combination with tissues. Why it should affect some parts rather than others depends upon affinities the nature of which is not known. It has been found *post mortem* in the heart, spleen, lungs, liver, kidneys, and intestinal walls, and also in the brain, spinal cord, and various muscular tissues. Aside from the presence of the poison, the changes of tissues in persons dying from lead poisoning are, so far as known, very undecisive. The intestines, in cases of lead colic, are said generally to be found, *post mortem*, contracted and empty, or some parts contracted and others dilated, and in this state intussusception sometimes occurs. Occasionally spots of hyperæmia are found, but full inflammation seldom. The paralyzed and wasted muscles are often found to be remarkably pale or yellowish; but no material structural change is discovered by the microscope. The muscles are usually simply atrophied, but fatty degenerations sometimes occur in long-continued cases. Whether the intestines and other muscular parts are affected by the lead deposited in connection with the nervous matter which supplies them with power, or whether from deposits in the muscles themselves, is not yet positively determined; but it is almost certain that in the voluntary muscles, and probably in the intestinal also, the chief morbid impression is upon the nerves, either in their course or at their origin.

The diagnosis of lead poisoning is important, whether the symptoms manifested are those of colic, paralysis, or the more obscure nutritive and nervous affections. The known exposure to lead will, of course, aid in the diagnosis; but the blue line of the gums, particularly at their juncture with the incisor teeth, and the peculiar symptoms which have been described, particularly the dropped hand, will lead to a conclusion. The symptoms, however, are sometimes obscure, and the sources of the poison may not be apparent or suspected.

The excretion of lead from the system is chiefly by the kidneys, though it is sometimes detectable in the perspiration and the milk, and is, doubtless, sometimes in the contents of the intestines. In doubtful cases its detection in the urine may aid in the diagnosis, and this fluid should be tested for its presence.

In distinguishing colic from severe pain in the bowels from other causes, from enteralgia, etc., the principle of exclusion must be employed. The known exposure of the patient to lead, and the other signs of plumbism, will determine the nature of the case.

Treatment.—In all forms of lead poisoning it is important to inquire into the sources of the lead, and to avoid further exposure. As prophylactic or antidotal to the more acute poisoning where lead has been swallowed, a pretty free use of diluted sulphuric acid will reduce the carbonate or acetate, etc., to an insoluble sulphate, and cathartics should then be given to expel all that remains. If sulphuric acid be not at hand, the sulphate of magnesia or sulphate of soda will act both as a chemical antidote and as an expelling agent, and should be freely given.

When an attack of lead colic is present, the severe pain and spasmodic action should be allayed by opiates, chloroform, fomentations, or, as some advise, cold by means of bladders of ice over the abdomen; and when the pain is thus checked, sulphate of magnesia or other cathartics, not with great nervousness and precipitancy, but in ordinary free doses and at proper intervals, should be given, and, if borne by the stomach, continued until, aided by large laxative enemas, a cathartic effect has been procured.

Sir Thomas Watson advises ten grains of calomel with two of opium, to be followed by a saline cathartic or by castor-oil. In some cases the inhalation of chloroform or ether, as in other forms of colic, will be well, and other anodyne medicines may be substituted for the opium where it is not well borne; but as a rule the opiates, morphine dropped upon the tongue, or administered hypodermically, with or without atropine, will be found most efficient, and sometimes free and repeated doses will be required to overcome the severe pain. The use of electricity has been recommended for overcoming the spasmodic action, or rather for relieving the paralyzed state of portions of intestine, and thus restoring more proper action and relieving pain. In obstinate cases this should be tried.

The general testimony of the profession is in favor of the use of cathartics to relieve the constipation as an important part of the treatment; but the necessity of very large or of drastic doses may well be questioned. The pain may be enhanced by fæcal accumulations, but this is not the cause of the suffering, and no unusual accumulations may be present. When there is no evidence of such accumulations, there need be no haste in moving the bowels, and the leading indication is to relieve the pain and the spasm. Large enemas of warm water or gruels may have a double effect of soothing the pain and spasm and of moving the bowels, and are to be recommended.

For eliminating the poison from the tissues the iodide of potassium has the greatest reputation. This article is supposed to enter into combination with the lead in the tissues, forming soluble compounds, and thus detaching the metal from the albumen with which it is associated, and preparing it for elimination from the system, which is chiefly effected by the kidneys. It is alleged that the lead is found in increased quantities in the urine after the administration of the iodide. As free and as often-repeated and as long-continued doses as the system will well bear, or as may be necessary for the accomplishment of the object, are advised. It may sometimes be given in drachm doses three or four times a day. Baths, medicated with the sulphide of potassium in the proportion of two ounces to fifteen gallons, have been recommended. They will remove any lead which may escape from the surface of the skin, and are unobjectionable; but there is no sufficient reason to suppose that they exert any special influence in eliminating the lead from the tissues. The same may probably be said of "electrical" and various other baths; they may be allowed or advised, but should not be relied upon to the exclusion of the iodide of potassium. Iodine ointments may be used where the stomach does not well bear the iodide, and when directly applied over the muscles, or in the course of the nerves implicated, as in the dropped hand, may be worthy of a trial.

Alum has a reputation in cases of lead poisoning, and writers of authority say it appears to be useful; but on what principle it acts is not clearly stated. I know of no reason for supposing it to possess eliminative powers. Like sulphuric acid or the sulphate of magnesia, it may convert soluble into insoluble forms, and thus be useful when lead is in the alimentary canal.

The elimination of the lead is the primary object in the treatment of all forms of chronic lead poisoning; but remedies may be used for the removal of its effects. Among those for improving the general condition and removing the anæmia, iron and other tonics, with pure air, proper food, etc., may be very useful. The special treatment for the paralysis will consist in the use of electricity, applied *secundum artem*, aided by the administration of strychnine. These remedies are particularly applicable to this form of paralysis after the lead is supposed to be eliminated, but where the paralysis continues from desuetude and atrophy of the muscles; frictions may also aid in restoring nutrition and proper action.

Various means may be useful in preventing the introduction of lead into the system in persons whose occupation or circumstances expose them to the article. When an individual's susceptibility is shown by the occurrence of symptoms, he should, if possible, avoid the occupation or circumstances which involve exposure.

Free ventilation if the lead is inhaled within doors, frequent ablution if it enters by the skin, frequent changing of the clothing when it becomes saturated with the preparations of lead, the use of fine masks or moist sponges over the nose and mouth when the fumes or dust of lead are unavoidable, not taking food amidst surroundings of lead, or food that has been kept within reach of its dust, etc., are among the means of prevention. It seems unnecessary to mention the avoidance of lead pipes for the conveyance of drinking water, or of leaden utensils for the storing of any ingesta.

Fortunately the use of leaden hair-dyes is much less frequent than it was some years ago, and it is to be presumed that the use of leaden cosmetics is confined to a few.

CONSTIPATION.—FUNCTIONAL OBSTIPATION.—COSTIVENESS.—HABITUAL SLUGGISH BOWELS.

A deficiency in the frequency and amount of fæcal evacuations constitutes constipation. The term costiveness is generally applied to the condition in which the evacuations are scanty, dry, and hard; and by functional obstipation is understood markedly unfrequent, deficient, and hardened dejections, or obstinate retention, where no mechanical obstruction to the evacuations exists. The expression "habitual sluggish bowels" is sufficiently explicit without a definition. The term functional constipation will sufficiently express all these conditions, and this is a very frequent symptom of various morbid states. In treating of indigestion it was alluded to, and something was said respecting its importance and the means for its relief.

Etiology.—A great variety of more remote causes may produce constipation, but it is chiefly dependent upon two principal conditions, viz., a deficiency of intestinal secretion, and diminished intestinal muscular activity.

A feeble or diseased condition of the abdominal muscles, which usually aid in the expulsion of the intestinal contents, may also contribute to the condition. A deficiency of the biliary and pancreatic secretions may also tend to the same end; and, indeed, a deficient secretion of bile, which deprives the intestines of a stimulant to their activity and a solvent of their contents, is not an unfrequent cause of this symptom. This deficiency of the secretion of the accessory glands should be placed rather among the more remote causes than the immediate conditions of constipation.

Deficiency in alimentation, or the taking of food with too little residual matter, often leads to constipation. Each species of the animal creation has an alimentary canal adapted in capacity to the food it habitually takes, and a certain amount of indigestible material, giving bulk to the fæcal mass, is important to a proper mechanical stimulation of the intestinal muscles; and when this is in too small quantity, deficient or deranged action is the result. The human stomach and intestines have their adaptation to an amount of residual substance which best promotes their action. When this is deficient that action is deranged, the proper mechanical stimulus is not afforded, and constipation is the common result. Constipation from this cause may be less injurious than from some others, but secretions and excreta which remain long in the intestines may undergo changes and produce unpleasant effects.

Want of proper muscular exercise is another cause of constipation. When the voluntary part of the muscular system is inactive, the involuntary is apt to sympathize, and a general stagnation is apt to follow.

Anæmia and general debility, from whatever cause, may produce a proportionate debility of the intestinal and abdominal muscles, which may result in constipation.

A want of proper nervous sensibility, so that the presence of fæcal matter in the intestines is not appreciated by the organism or the sensorium, is another cause of constipation. Under this head will come mental absorption and neglect to attend to the intimations of the senses with regard to evacuations.

Habit has much influence over the function of defecation, as over so many other functions of the body, and an habitual neglect of this may lead to its exceedingly deficient and irregular performance.

Many of the causes which produce muscular inactivity produce deficient secretion also; but there are some special causes which tend to produce deficient secretion of the intestines. A loss of the fluids of the system by free perspiration, or by excessive urinary secretion, as in diabetes, tends to this result. In various dyspeptic conditions and in feverish states this deficient intestinal secretion is marked, and a deficient action of the secretion of the intestinal follicles, independent of other morbid conditions, may occur.

Many, even of the enlightened members of the profession, do not fully appreciate how injurious are the effects of habitual constipation. The long-continued retention of matter which should be expelled, often undergoing putrefactive changes, is almost certain to be followed by the absorption of materials which contaminate the blood and the system. Moreover, the presence of mechanically or chemically irritating materials continually impressing and more or less irritating the intestinal nerves, affects very unfavorably the whole nervous system, especially in sensitive persons, and leads to a great variety of sensitive, motor, nutritive, and even mental abnormalities.

Symptoms and Diagnosis.—The particular symptoms induced are various; pain, heaviness, and a feeling of confusion in the head, a coated tongue, foul breath, abdominal distention, uneasiness and pain, loaded urine, hemorrhoidal tumors, indigestion, etc. When long continued, general derangement, and often permanent impairment of health ensues.

The diagnosis would at first view seem to be easily made by inquiring if the bowels are regular, or if evacuations regularly and daily occur. In some cases, however, this is not sufficient. Sometimes evacuations regularly, or even frequently take place, while large accumulations still exist. More exact information must be obtained not only as to the frequency, but as to the free and satisfactory character of the discharges ; often the abdomen should be examined by palpation and percussion, and it may even be necessary to explore the rectum by the finger or a sound to determine the fact of accumulations there. Fæcal tumors will sometimes be found in the course of the colon. They are usually irregular in form, and may be hard and unyielding, but generally by making firm pressure slowly with a single finger, an indentation is made, which could happen in no other tumor.

Sometimes a patient complains of repeated attacks of diarrhœa, when it will be found on more particular inquiry that the actual disease is constipation, the bowels remaining in that condition until the fæcal accumulations are so great as to produce an irritation which results in an increased peristalsis, pain, etc., and these will be the symptoms complained of. The evacuations, though at the time painful, procure relief, to be followed again by the constipation.

In the normal state and the ordinary condition of health, with a proper performance of all the functions, when a proper quantity of an ordinary quality of food is taken, an alvine evacuation occurs at least once every twenty-four hours. There are rare cases where good health appears to be enjoyed, but where evacuations are much less frequent. They are, however, exceptional and abnormal, and even such cases are likely to be followed, in time, by impaired health. As a rule, then, when movements of the bowels occur less frequently than once a day for any considerable time, constipation is present and requires attention.

Treatment.—When this condition occurs temporarily from accidental causes, and no condition such as enteritis or peritonitis is present to contra-indicate, a cathartic should be given or an enema administered to remove the symptom. The kind of cathartic to be chosen depends upon the character of the constipation, the length of time it has continued, whether it arises from mere sluggishness of muscular power, from deficient secretion, or some other morbid state. A mercurial followed by a saline is more efficient in increasing and modifying the secretion than most other cathartics. Aloes and senna act more upon the muscular contractility; jalap nearly equally excites secretion and peristaltic action; castor-oil lubricates the intestines and their contents, and excites vermicular motion; and each cathartic has its own peculiar effect and adaptation to particular conditions.

It is often the case that a cathartic which produces a decided effect is followed by a period of greater inaction of the bowels, but this should not prevent its administration when indicated by positive symptoms.

Sometimes enemas will be sufficient to remove accumulations from the lower bowels, and they impress the system less than a cathartic of more positive and active qualities.

Chronic or habitual constipation is often met with, and requires other management than the mere administration of cathartics. The causes here must be inquired into, and these, as well as the mere symptom, call for remedial measures. The treatment then must be partly in reference to removing the symptoms and partly in reference to the fulfillment of the causative indication.

The immediate means for relieving the symptom embrace not only the use of cathartics and enemas, but various accessory measures. In large accumulations in the rectum, mechanical means may sometimes be required. The handle of a spoon is often recommended as a fitting instrument for the purpose.

Certain articles of food, which by their mechanical or some other property increase peristaltic movements or intestinal secretions, and thus produce a laxative effect, are often useful. Preparations of corn meal, wheaten grits, unbolted flour, oatmeal, rye flour, etc., and the use of various vegetables and fruits, will often suffice to keep the bowels open. They produce their effects, for the most part, by the mechanical stimulation which their indigestible constituents afford to the muscles of the intestines. When these articles of food do not disturb the stomach and the digestion, they should often be preferred to medicines. Though they are more palliative than curative, their use for a length of time not unfrequently establishes a *regular habit*, which is a very important matter where an irregular habit has perpetuated constipation. Where an irregular habit is by any means broken up, and habits of regular evacuations established, the patient may often return to an ordinary diet, and particular measures may be discontinued while the new habit will be kept up. The particular dietetic measures must be governed, to a considerable extent, by the experience of the patient. Particular articles from the general list above given may be selected. Graham bread and cracked wheat, and oatmeal and ryemeal mushes, are among the best dietetic articles. They are highly nutritious as well as laxative. Among fresh vegetables, tomatoes, peas, string beans, and the standard potatoes may be mentioned; and of fresh fruits, apples, peaches, grapes, and oranges are among the best. Of dried fruits, figs, raisins, and prunes deserve mention. A free drink of water some time before breakfast, more than will be readily absorbed from the stomach, and which passing into the intestines will supply to their costive contents the proper moisture, will sometimes serve an excellent purpose. The addition of half a drachm or a drachm of common salt, while not particularly unpalatable, will add to the efficacy of the water.

But these means are often ineffectual, or some conditions are present which require more particular modification, and medicinal measures are demanded.

Among the *laxatives*—for active cathartics should, as a rule, be given in habitual constipation only in exceptional cases, and for the most temporary effects—are a great number of articles from which combinations and selections may be made. Here the adaptation to particular cases is also important. The article and the dose should be such as to prevent fæcal accumulations without producing purgation, and as far as possible to induce regular daily movements. To effect this, moderate, frequently small, but repeated doses will be required, often continued for a considerable time, until a regular habit is established. It cannot be too strongly impressed that, after accumulations that may be present at first are removed, the patient is not to be purged. The practice of taking active purges, allowing the bowels to remain torpid until large accumulations take place, and then repeating the purgative, is, in most cases, particularly pernicious. The constipation is liable, in this way, to be increased and confirmed.

In some cases where the secretions of the intestines and accessory glands are deficient or perverted, a grain or two, more or less, of blue mass may be given every night or every second night for a few times in succession, and a drachm or two, more or less, of a laxative salt—sulph. of soda or magnesia, or phosphate of soda or Rochelle salts, given next morning in a half pint or a pint of water, often as warm as can well be taken, will be found to answer an excellent purpose. Often a little ginger or some other aromatic may be added to the potion. The morning saline draught may be continued as may be required, after the alterative has been discontinued. What are called "bitter waters" are often useful, such as Püllna, Janos, Seltzer, Apollinaris, Congress water, etc. I have often prescribed an imitation of Carlsbad water, composed of sulph. of soda, carb. of soda, and common salt, taken half an hour or an hour before breakfast, in a large drink of warm water, as mentioned when treating of the diseases of the stomach.

Where, however, there is muscular debility of the intestines, rather than a perversion of their secretions, other forms of laxatives are much more appropriate. A number of the vegetable laxatives, some new and some old, are available. Among these are aloes, colocynth, rhubarb, buckthorn, podophyllin, euonymin, cascara sagrada, and some others.

The vegetable narcotics—belladonna and hyoscyamus—have some laxative properties, and when combined with more decided cathartic substances, by their soothing effects modify the "griping" qualities of the more irritating articles, and promote their action. The nux vomica, or its most active principle strychnia, gives tone to debilitated muscles and promotes their activity. Ipecacuanha in small doses increases gastric and intestinal secretions, and thus tends to overcome costiveness.

In the course of a long experience, I have observed the effect of a large number of laxative medicines and compounds in sluggish bowels or habitual constipation. The formulæ for many of these preparations may be found in various works; several are appended to this article; but I have found no combination as effectual and unobjectionable, and applicable in as large a number of cases as the pill for which a formula was given in another place, but which is deemed proper to be repeated here.

℞	Aloes (purified)	ʒj
	Ext. Hyoscyamus	ʒj
	Alc. Ext. Nux Vomica	grs. xij
	Pulv. Ipecacuanha	grs. vj

M.—Ft. pil. No. xxx.

One or two pills to be given each night, varying the quantity often by dividing a pill, or increasing the number, but so as to secure a satisfactory movement the next morning. This should be continued steadily until the habit of regular movements is well established. The medicine may often then be withdrawn without interrupting the habit.

The aloes is of course the chief laxative agent, operating mostly upon the large intestines, the hyoscyamus promoting its action and at the same time modifying its irritating effects, while the ipecac. produces some effect upon the secretions, and the nux vomica more permanently increases the tone and muscular power of the intestines.

At all events, whatever may be the mode of its operation or character of the explanation, a long experience in the use of this compound, the proportion of its ingredients being sometimes varied in particular cases, has induced me to be so particular in its recommendation. Various other compounds embracing similar ingredients, administered in view of similar therapeutical principles, may be equally efficient and better adapted to particular cases; but none on the whole has been found quite as satisfactory, and as often applicable, as this.

In anæmic cases the simultaneous administration of preparations of iron, or iron and quinine, etc., will be called for. Indeed, whatever other pathological condition may be present, operating as a cause of the constipation, must receive its appropriate treatment.

The treatment of constipation with repeated and long-continued enemas, although affording temporary relief, must be considered as often objectionable. Although occasionally not only justifiable, but the best means that can be used, they do not tend to strengthen the intestines or increase their proper secretions, and too often they diminish that natural sensibility which induces an effort at evacuation when only a moderate quantity of fæcal matter is in the rectum. In this way they tend to establish in the part a habit to act only when there is large mechanical distention, and thus promote and establish the condition they are intended to remedy. Dr. Flint remarks, "repeated daily, they cease after a time to be effective, and they interfere with the recovery of the muscular power and sensibility of the rectum." * Their great utility for temporary effect in many cases, especially of acute constipation, and when occasionally used, can but be appreciated—it is their continued and habitual use that is objectionable.

But there are other means more important than medicines in the treatment, and especially in the prevention of habitual constipation. The importance of dietetic management has already been alluded to. A sufficient and varied diet, with a proportion of indigestible matter, the nutrient principles not too much concentrated, should be taken. A proper amount of exercise should be secured by persons of sedentary pursuits, and, in short, all the ordinary hygienic rules should be observed.

The most important means, however, of preventing this very common affection is to establish regular habits of defecation, the same hour being observed each day, and sufficient time being given to the process to secure a thorough evacuation. No call of business, pleasure, or occupation should allow this "call of nature" to be interfered with. Remaining long upon the stool in ordinary cases is by no means necessary or useful. Such a habit rather tends to produce congestion of the lower bowels and to cause hemorrhoidal tumors or

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* Clinical Medicine, p. 352.

prolapsus ani; and much straining at stool is often dangerous, especially when there is a tendency to cerebral congestion or apoplexy. Still, a complete evacuation of the contents of the rectum is important, and all the necessary time should be taken to accomplish it. If the bowels are sluggish in their action, kneading the abdomen may hasten and aid the process. The power of the will must be made available, and due attention must be given to a function so essential, the proper performance of which is so necessary to health and comfort. In order to avoid the inducement to leave the closet too soon, the too frequently disgusting condition of these places should be remedied. Where a well-arranged water-closet is unattainable, as is often the case in the country, a properly constructed earth-closet should be provided, and this is easily accomplished everywhere in country situations. More attention than is usually given to conveniences of this kind is essential for reasons of decency, individual comfort, and health, as well as for the avoidance of wide-spread zymotic diseases.

Decent, cleanly, inodorous, and ornamental commodes are better evidences of civilization and refinement than statues and monuments or common house decorations. A small fraction of the expenditure which sometimes makes pretentious houses glaring, or to a refined taste hideous, would make these places cleanly and attractive which are often so injurious, dangerous, and revolting. The importance of establishing and keeping up regular habits of defecation, either by voluntary efforts, or when necessary by medicines, cannot be too highly estimated, or the practice be too strongly insisted upon. When the habitual hour arrives for this organic act, it usually brings with it the desire and the ability for its performance.

By attending to the preventive regulations which have been recommended, the number of cases of habitual constipation would be vastly diminished, and its many evil consequences obviated.

The following prescriptions by others are made in accordance with the principles which have been stated in the preceding account, and are presented as specimens from which selections may be made in treating different cases of this very common complaint:

℞ Ext. Aloes, Ext. Hyoscyamus, of each ʒj; Ext. Nux Vom., grs. xij; Oil of Anise, gtts. x. M.—For 60 pills. Dose, one or two each night.

℞ Ext. Aloes, ʒss; Ext. Nux Vom., grs. vj; Ext. Hyoscyamus, grs. xx; Pulv. Ipecac., grs. ij. M.—For 20 pills. One at night.

℞ Confection of Senna, ℥j; Bitartrate of Potash, ʒij; Precipitated Sulphur, Subcarbonate of Iron, of each ʒj; Honey or Syrup sufficient for an electuary. Two tea-spoonfuls each night, or one after each meal.

℞ Aqueous Ext. Aloes, gr. ss to j; Sulph. of Iron, grs. jss to ij. M.—For a pill. To be taken after each meal for a time, and then less and less frequently.

℞ F. Ext. Cascara Sagrada, ʒss to ʒjss. Taken at night or oftener.

℞ Purified Oxgall, ʒij ; Oil of Caraway, ♏x ; Calc. Magnesia, q. s. M.—For 30 pills. Two twice a day when deficiency of bile.

℞ Ext. Stramonium, grs. x ; Cocoa Butter, q. s. M.—For 15 or 20 suppositories. One or two in a day in pelvic irritation with constipation.

DIARRHŒA.

EXCESSIVE FUNCTIONAL DEFECATION.

Diarrhœa is defined as too profuse, too frequent, and too liquid intestinal evacuations.

It may be divided into functional and organic diarrhœa. In the latter there are structural changes in the intestines, such as inflammation or ulceration, while in the former no such marked changes exist.

It may also be divided into symptomatic and idiopathic diarrhœa. In the former it is a symptom of, or is dependent upon, some other disease or distinct pathological condition; while in the latter it is the principal or only morbid phenomenon noticeable—is itself the disease.

It has already been considered as a symptom of muco-enteritis and ulceration of the intestines, of typhoid, malarial, and eruptive fevers, etc., and will hereafter be considered as a symptom of some diseases of the liver, of the kidneys, of phthisis, and other affections.

Considered as an idiopathic disease, or in itself the principal affection, it has several recognized varieties, depending upon the peculiar symptoms presented, and the causes producing them. The different varieties, however, run into each other, and the lines between the organic and functional, and the symptomatic and idiopathic, are not strictly drawn or well defined. A rigid division and clear and positive distinctions are not always necessary; but they are referred to for the purpose of giving more complete views of the different aspects the disease presents.

Diarrhœa Crapulosa is where there are frequent fæcal but liquid discharges. The contents of the small intestines are generally liquid, or at least semi-fluid, and if this matter is not retained in the large intestines, and if time is not given for the absorption of much of the liquid portion, the fæcal matter will continue in a fluid state and be discharged in that form. Simple increased peristaltic action, therefore, would cause liquid stools. But the same cause which usually produces increased peristaltic action also causes more or less increase of liquid intestinal secretion, so that too liquid evacuations are characteristic of this, as of other forms of diarrhœa.

This form of diarrhœa may be caused by repletion, by too great a quantity of digested food and blood, or it may be caused by taking more food than can be fully digested and appropriated. Improper qualities of food often cause irritation and increased peristalsis and secretion, and in these cases the effect resembles that of a cathartic, and is often relieving and useful. Various articles, as salads, veal, green corn, cucumbers, unripe fruits, etc., produce these effects in persons usually in good health.

Often irregular, as well as increased, peristaltic action, accompanied by griping pains, attends many cases; and sometimes distention of the abdomen, sickness of the stomach, with coated tongue and foul breath are present. But there is no chill or tenderness, and little or no fever. When chills, much fever, and tenderness and tenesmus occur, the case becomes one of muco-enteritis or intestinal catarrh.

Not unfrequently a change of locality and mode of living induces this form of diarrhœa, the effect being generally attributed and often properly, to change of drinking water.

Fear, and other forms of mental excitement not unfrequently induce diarrhœa. An approaching battle often has this effect upon new recruits, and sometimes upon veteran soldiers; and, with some speakers, the prospect of appearing before an audience produces similar results.

Most forms of diarrhœa are more likely to occur in summer and autumn than at other seasons of the year, and the same causes which produce muco-enteritis, operating less violently, cause irritation rather than inflammation, and in both instances diarrhœal discharges.

The diarrhœa is called *Lienteric* when the passages contain food undigested. A diarrhœa caused by improper articles of food generally cures itself. It should be favored by diluent drinks rather than abruptly checked, and the cure may often be accelerated by laxative medicines. Anodynes may be needed afterward if there be much irritation or pain; or a laxative and anodyne, as castor-oil and tinct. of opium, may be given together.

A *Bilious diarrhœa* is one produced by a profuse or perverted secretion of bile, irritating the intestines and thus causing the effect. It is more common in hot weather and climates, and where other bilious derangements occur. Bile when in excess, as it often is temporarily where its excretion is irregular, operates as a cathartic. It sometimes regurgitates into the stomach causing vomiting, and with the purging constitutes a form of cholera morbus. In such a case the evacuations should not be arrested until the offending materials are expelled. As in cases from improper ingesta, the evacuations, if not free, may be promoted by warm water or by emetics and laxatives. Ipecacuanha, Seidlitz powder, rhubarb, magnesia, etc., are among the remedies which will fulfill the indications. Mercurials and alkalies may be needed to correct the secretions or neutralize acidity.

A serous diarrhœa sometimes occurs in albuminuria and dropsical conditions, when the blood is thin, and a free endosmotic effusion occurs into the intestinal cavity.

Urea is often discharged and dropsical effusions are reduced by such a diarrhœa, and, as a rule, it should be encouraged rather than checked; it may often be imitated by cathartics with great advantage, especially where there are large dropsical accumulations, or where symptoms of uræmia are present.

In diseases of the liver, with obstructed circulation through that organ, the portal congestion following is sometimes relieved by a diarrhœa. This, too, is not to be checked unless excessive and depressing.

Diarrhœa sometimes arises from "taking cold"—checking the circulation and secretion from the skin, and causing a determination of blood and a free secretion from the intestines. As the diarrhœa is likely to relieve the internal congestion, it should be directly interfered with only when excessive. The action of the skin should be restored as soon as possible, and the warm bath, diaphoretics, etc., will be useful.

Diarrhœa from the Inhalation of Noxious Vapors, animal putrefactions, fæcal fermentations, etc., accompanied often by specific zymotic poisons, not unfrequently occurs, and sometimes in an epidemic form. Here, also, the evacuations tend to eliminate the poison from which the system suffers, and within proper limits may be useful.

In many of the cases muco-enteritis is present, accompanying the diarrhœa; and then the case should be treated for that disease in the manner already sufficiently described.

A Critical Diarrhœa not unfrequently occurs in connection with the subsidence or turning-point of inflammations and fevers. During the progress of these diseases, effete matters accumulate in the system and are eliminated at their abatement in this way. The strength of the patient should be sustained as required, but these discharges are to be checked only when dangerous from their profuseness.

A Colliquative Diarrhœa, in low conditions of protracted diseases, and in connection with profuse sweats, occurs as collapse approaches or is established, and is often terminal. It should be checked as promptly as possible by stimulants, tonics, and astringents, where the nature of the disease upon which it depends does not render all efforts hopeless and useless, and where such measures would only produce disturbance and annoyance. In the advanced stages of some acute diseases not necessarily fatal, the scale may be turned by the continuance or arrest of such a diarrhœa. In such a case, treatment may be of the utmost importance. Opiates, astringents, and stimulants, by the stomach and rectum, must be promptly and judiciously employed.

The Camp Diarrhœa of our late war has already been considered under the head of muco-enteritis, as that condition gave the disease its leading characteristic.

So far, in the account of the disease, diarrhœa, for the most part, has been considered as at least a harmless, and generally a useful, process. But sometimes cases of diarrhœa occur where no good but only evil results are produced by the profuse discharges. In some of these cases, though no distinct pathological condition aside from the diarrhœa is recognizable, yet some morbid excitement in the secreting vessels and the muscular tissue of the intestines exists, probably from changed innervation of the parts, which is the immediate cause of the excessive discharges.

In other cases—those before described—though the diarrhœa at first may be innocent or useful, yet it may be so violent or so protracted as to demand arrest. Each case must be judged of by itself, and remedies for arresting the discharges must be resorted to or withheld according to its nature and tendencies.

Causes.—Before describing the means for arresting these discharges, it may be well to recapitulate the *causes* which produce them.

1st. Improper ingesta; water to which the person is unaccustomed; and change of locality and habits; or irritating matter produced by changes in food from imperfect digestion.

2d. Checking the action of the surface by cold and moisture.

3d. Exhaustion and debility.

4th. Poisonous inhalations.

5th. Zymotic poisons, sometimes local, and sometimes more general in prevalence.

6th. Excessive secretion of irritating bile.

7th. Obstructed circulation through the liver, and congestion of portal vessels.

8th. Œdema of the intestinal membrane, and profuse endosmotic effusion in Bright's disease.

9th. Strumous disease, and suppurative processes in the system.

10th. Septicæmia and various blood poisonings.

11th. Inflammation and ulceration of the intestinal mucous membrane.

12th. Critical conditions at the subsidence of inflammations and fevers.

13th. Mental agitation and fright.

14th. Typhoid, and eruptive, and other fevers.

15th. Diseases of the mesentery interfering with absorption from the intestines.

Treatment.—In treatment the cause and pathological condition must be carefully observed, and rational indications formed in the mind, and direct interference with the discharges must only occur when all the conditions of the case render it necessary.

The treatment of symptomatic cases will be best considered in connection with the diseases in which they occur.

The means to be used for arresting a diarrhœa will be varied by the cause which has produced it.

Those more directly calculated to accomplish that object are opiates and astringents, and sometimes stimulants. Rest—a recumbent position in all acute cases—is always proper, and often important. The temperature and clothing should be regulated according to the conditions of each case, and as the sensations of the patient require. Warmth to the extremities is often called for, and sometimes over the bowels.

The diet should be particularly guarded. In acute cases abstinence for a day or so may be enjoined. In many cases scalded milk, with which some plain water or lime-water and some thoroughly cooked farinaceous substance may be mingled, will be found useful; and in mild cases, free from inflammatory tendencies, black pepper may be added.

In many cases a few doses of camphor in substance, in tincture, in the form of emulsion, or in camphor water, will suffice to check the discharges.

In some cases a simple stimulant, such as tinct. of ginger, cinnamon-water or mint-water, will be useful and sufficient. A little brandy and water, or brandy in hot coffee will check some cases. Various astringent tinctures, as tinct. of blackberry or kino, etc., will often suffice.

In many cases the subnitrate of bismuth, alone or mingled with a moderate quantity of pulverized cinnamon, in doses of fifteen or twenty or more grains of the bismuth, will answer an excellent purpose. Sulphuric acid, acting as an astringent and tonic, has a reputation in diarrhœa, and sometimes is efficient.

Chalk mixtures are often used, especially in the diarrhœas of children. My own experience has not convinced me of their great efficiency, but authority is in their favor, and they may be tried.

Lime-water is more frequently useful. It is astringent and anti-acid, and given in milk prevents that article from coagulating in large masses, and corrects the acidity of the alimentary canal, so often present in these cases.

In the severer cases, and especially where there is much pain, opium in some of its forms will be required, and is in most cases by far the most efficient remedy. A single dose, or a few doses, will often answer where other remedies have failed, and in cases of considerable severity should not long be withheld. It has the great advantage of being applicable, after the evacuations have removed irritating matters, where there is a tendency to inflammation, when astringents and stimulants might increase the irritation.

Some cases may require a combination of astringents and opiates. The more active astringents are tannin, acetate of lead, and the astringent preparations of iron. When cases become subacute or chronic, the preparations of iron are often particularly applicable.

It is seldom that diarrhœa becomes chronic unless more or less inflammatory action occurs, or ulcerative processes are set up; and this takes the case beyond the limits of simple functional diarrhœa. These cases have already been discussed. The fl. ext. of coto bark has become a favorite with many.

Many cases border on an inflammatory condition, where it may be impossible to determine whether inflammation is present or not; and these will require treatment such as has been advised for intestinal catarrh. In some subacute cases the turpentine emulsion, or liquor ferri ternitratis, sulph. of iron and opium, nitrate of silver, balsamic preparations, subnitrate of bismuth, or some other astringent, often in frequent and repeated doses so as to keep up a continuous action, will be required.

Not unfrequently mercurials, to modify the secretions of the mucous membranes and the liver, and these followed by laxatives, will do more than the astringents in arresting the disease.

When diarrhœa depends upon imperfect digestion, gastric or intestinal, the improvement of this process should be the chief object of treatment; and so of all the other causes that are discoverable and can be reached by remedies.

Diarrhœa is seldom strictly idiopathic—is almost always when protracted symptomatic of some other pathological state, and its treatment must therefore be varied according to the more essential conditions. Those cases which approach nearest to the idiopathic type are dependent upon debility and relaxation of the intestines, with a morbid irritability, or extreme susceptibility to the impressions produced by their contents. Some are markedly neuropathic. In these cases tonics are often demanded. Quinine, iron, arsenic, strychnine, etc., as the general states of the system may require, will be the most efficient means of cure. At the same time astringents will palliate the symptoms, and aid in accomplishing the removal of the disease.

When a malarial influence is present, the antimalarial remedies will, of course, be important.

Sometimes large quantities of fat are passed in the stools, constituting a form of fatty diarrhœa. These cases are rare, and have generally proved fatal; but a few cases of recovery have been reported. This form of diarrhœa is supposed to be dependent upon disease of the pancreas, so that the fat taken in the food, or produced by any transformations, fails of being emulsified and appropriated by the system. Not only the pancreatic juice, but the bile acts as an emulsifier of fats, and an object of treatment would seem to be to increase the secretion of the pancreas and liver. We know very little of the effect of medicines upon the pancreas, but there are various substances that increase the secretion of the liver, and these may be indicated.

Cases of fatty diarrhœa have been reported as cured by large doses of olive-oil, and also by the free use of alcohol; but on what rational principles either of these articles operates it is difficult to understand; and it is quite possible they have had nothing to do in effecting the cures reported. Other cases have been reported as cured by the use of pancreatic emulsion. The good effects of this article can be better understood. Not unfrequently the discharges in diarrhœa are clay or ash colored, and apparently contain no bile. In these cases the condition of the liver must be looked after, and means taken to restore its function.

In chronic cases, great attention to all hygienic regulations is necessary, especially to warm clothing and *proper diet*, and often a change of climate effects favorable changes which medicines have failed to accomplish.

Children are more subject to diarrhœal symptoms than adults, but in them muco-enteritis is so commonly present when these symptoms appear, especially for any length of time, that it is scarcely necessary to treat of the peculiarities of diarrhœa in them, independent of the inflammatory condition. They doubtless frequently have temporary attacks without distinct inflammation, but the same principles of treatment apply as in adults, and further repetitions are unnecessary.

DISEASES OF THE PANCREAS.

The pancreas is subject to various morbid conditions, as is proved by *post-mortem* examinations, and inferred by the indigestion of fats and by some other symptoms during life. It is subject to inflammations, suppurative, and plastic or intestinal; to degenerations, fatty and waxy; to tuberculous and syphilitic deposits or productions, and to cystic and cancerous growths. All these conditions are rare, and their distinctive clinical history is almost unknown, as they, for the most part, are incapable of being clearly distinguished. The indigestion of fats, which may be distinguished by a fatty diarrhœa, and the fact that this substance habitually produces unpleasant symptoms, leads to a suspicion of pancreatic disease; and pain, tumors, or tenderness in the region where it is situated, and which could not be located in other organs, might render disease of this organ probable, if not certain.

In a case within my experience, where there were severe, repeated, and long-continued attacks of pain, a moderate-sized tumor was detected in the region of the pancreas, and the cancerous cachexia was apparent. Cancer of the stomach was rendered improbable by the absence of vomiting, and by there being no special aggravation of suffering from taking food, or other particular gastric symptoms; and scirrhus of the pancreas was the diagnosis given, which an autopsy afterward confirmed.

Cancer of the pancreas is not particularly rare. It is oftener secondary than primary, and appears nearly twice as often in males as in females. The suffering in these cases is very severe, paroxysms of pain are often agonizing, probably from involvement of the solar plexus, and jaundice, dyspepsia, and dropsy may accompany its progress. Its course is more or less rapid according to the variety of the cancer and the power of endurance of the patient, but it seldom persists beyond a year.

A tumor of this organ, situated as it is so near to the aorta, is liable to have the pulsations of the artery communicated to it, and even to cause a blowing or thrilling murmur, and might be mistaken for an aneurism. But if the abdominal walls are sufficiently thin, so that the tumor may be grasped and elevated from its situation, the aneurismal character will be lost.

The natural pancreas in emaciated persons with flattened abdomen may be felt, and might be mistaken for some morbid growth, but proper care, with a recollection of its size, shape, and situation, will prevent such mistake.

Calculi have been found, though very rarely, in the pancreatic ducts, and their passage would be likely to cause pain; but in such a case it would be difficult, if not impossible, to distinguish it from the passage of biliary calculi. When in the common duct jaundice might be induced, and no distinction could be made unless an opportunity of examining the calculus should occur.

The pancreatic fluid not only emulsifies fats, but changes starch into dextrine and grape sugar, and in fact is capable of producing most digestive changes in foods; and it seems to supplement other digestive actions and complete the process in articles which have escaped the action of the other fluids, but it is not absolutely essential to any of the digestive changes. This renders it more difficult to distinguish with positiveness its derangements.

Inflammation resulting in suppuration, as already stated, may occur in the organ, but the symptoms, though they may be severe, are not distinctive.

The difficulty of a differential diagnosis between the diseases of this and other parts in the region is less to be regretted, as the therapeutical indications would scarcely be different if the distinctions could be more clearly made. The treatment would be much the same as for similar disease of the liver and spleen, which are more common, and soon to be discussed. It will be symptomatic, and in no way specific or peculiar.

DISEASES OF THE SPLEEN.

The spleen is a frequent seat of morbid changes. It is almost constantly congested and enlarged, more or less, in malarial and typhoid fevers, and very often in other fevers as well. In long-continued ague it sometimes attains very great size. In cirrhosis of the liver particularly, and in all obstructions to the portal circulation, its very vascular structure renders it liable to congestive enlargements. It is commonly enlarged in pyæmia, and may be the seat of secondary abscess; and in leucocythæmia, probably as a cause of that condition, it is generally enlarged, and perhaps always in some morbid states.

But the spleen is liable to disease independent of other morbid conditions. That which is best known pathologically, and is often recognizable clinically, is splenitis, sometimes suppurative, resulting in abscess, at other times in proliferating forms resulting in hyperplasia, always accompanied by hyperæmia and enlargement from distention of vessels. Waxy or lardaceous degenerations, carcinoma, tubercular deposits, and hydatid cysts also occur. It is also subject to atrophy and some other morbid processes.

Hyperplasia, commonly spoken of as hypertrophy, is common from a variety of causes, and more or less of this usually occurs when simple congestion of the organ is long continued.

Diagnosis.—Enlargement of the spleen, then, by congestion, inflammation, hyperplasias, tumors, etc., is a frequent condition, and is detectable by physical exploration. The normal size of the organ is, of course, the point of departure for conclusions in such examinations.

The spleen varies in size within normal limits in different individuals of equal general bulk, and in the same individual in the physiological state at different times.

It is movable by the looseness of its peritoneal attachment, and varies in its situation slightly, and in some persons considerably, by changes in the position of the body. Like other organs in the upper part of the abdomen, it follows the motions of the diaphragm to some extent, as it moves in respiration, and is changed in its position upward or backward by the distention of the stomach and intestines. Diseases of the chest which cause descent of the diaphragm press it downward, and sometimes the looseness of its attachment is so great that it descends, especially when its weight has been increased by disease, to different positions in the abdomen, even so low as the pelvis. In many of these cases it can be moved about with freedom, and can be pushed up to its original position. In other cases, however, it may have become fixed by adhesions in its abnormal situation.

When in its normal place and of its natural size, it is concealed in the concavity of the diaphragm, and, from its protection by the ribs, it can only be felt in very thin persons with flaccid abdominal walls, and then only when a full inspiration is taken.

Its upper extremity, and general position and size, can, with a reasonable degree of accuracy, be determined by percussion. It will be found to vary from one to two inches in its situation by a deep inspiration and a forced expiration. Its posterior and inferior border is not so distinctly determinable in consequence of its close proximity to the left kidney; but the lower anterior extremity can be proximately ascertained by contrasting the percussion note over it with the tympanitic sound of the stomach and colon. Its usual boundaries above and below are about the ninth and eleventh ribs. The anterior border does not quite reach the middle axillary line when the patient lies upon the right side, which is the best position for the examination by percussion.

These points, for the purpose of an accurate examination in doubtful cases, are important to be observed. As a rule, when the spleen is enlarged it extends chiefly downward, forward, and toward the median line. Its upper extremity is not much raised unless other abdominal enlargements push it up, or thoracic contractions draw it in that direction. When there is any considerable enlargement its lower extremity can be examined by palpation, and this is generally more satisfactory than by percussion.

It gives to the touch a distinct sense of resistance below the ribs, and when the walls of the abdomen are not thick and resisting, its margin can be grasped by the hand. Unless affected by tumors—cancer, hydatids, etc.—or by an abscess, the hard and well-defined body is smooth to the touch, and it generally, when enlarged, retains its normal shape, and, by passing the fingers over the inner and lower part, the splenic notch, or hilus, can often be recognized, which would give assurance of its being the spleen.

To distinguish it more clearly from thickening of the abdominal walls, it will be found movable beneath them, and will now; as in the normal condition, rise and fall vertically in the abdomen by the movements of the diaphragm in respiration.

The spleen may be so much increased in size as to occupy a very large portion of the abdomen, resting upon the pubis or even pressing down into the pelvis; and in more than one instance I have seen it mistaken, in the opinion of medical men, for an ovarian tumor. Sometimes with an enlargement of less extent there is a displacement downward, so that the upper margin can be felt more distinctly, than the lower, and the tympanitic resonance of the stomach and colon being observed above the enlargement, such cases are well calculated to deceive the observer. Where the upper portion of the organ retains its position, the dullness on percussion extends above the margins of the ribs.

In one case where a large quantity of peritoneal effusion was present, with an enlarged and greatly displaced spleen, the diagnosis was very obscure until a diminution of the fluid revealed the state of the case. The spleen was near the centre of the abdomen, more to the left, but extending to the right beyond the umbilicus; was more than the breadth of the extended hand in its smallest diameter; was movable to a limited extent in all directions, its right extremity being more free, and its complete outline distinctly discoverable.

When this organ is enlarged by cancerous or hydatid tumors, or by abscesses, its surface is nodulated or irregular, of variable degrees of hardness or softness, and its outline is apt to be unsymmetrical.

So particular a description of the mode of distinguishing the enlargement of the spleen has been deemed advisable in consequence of the frequency of its occurrence, especially in malarious regions, and from the obscurity of some cases, and the mistakes respecting them so many times observed.

A brief account of the particular diseases of the spleen seems appropriate.

CONGESTION OF THE SPLEEN.

Congestion of this organ is a condition of common occurrence, and arises from a variety of conditions, as already observed. The organ is so vascular, so loose in its structure, and so easily distended with blood, that it serves as a reservoir when portal congestion occurs, relieving other abdominal organs, more or less, of their surplus of this fluid. It contains more blood during the process of digestion than in other physiological states, and in a large number of general and local diseases the spleen suffers engorgement.

In congestion the increased blood is in the small vessels and the intervascular blood passages, and the rapidity with which the spleen may be enlarged and diminished by this flow and ebb of blood is quite remarkable. It may attain without hyperplasia three or four times its normal size; and sometimes, as in fevers, becomes of a deep wine color, is pulpy, and may easily be lacerated, and sometimes is even diffluent. When the congestion is for a long time frequently repeated, as in a neglected ague, or is constant for a lengthened period, as in cirrhosis of the liver or obstructive disease of the heart, the enlargement often becomes very much greater and more permanent, partly from the distention of the vessels, and partly from the hyperplasia produced by the continued presence of so much blood.

Simple congestion of the spleen, or this consequent hyperplasia, frequently reveals itself by no other local symptoms than a sense of fullness and weight in the region, and even this may be unnoticed; but sometimes a pain is felt, and there is tenderness on pressure, especially when the distention is rapid or great. It is to be discovered by the method of physical exploration above described.

Where the local symptoms are but slight, the function of the spleen as a blood-elaborating organ is to a greater or less extent impaired, and anæmia and debility are apt to follow. In many cases the sclerotic coat of the eye presents a peculiar blue appearance, and in malarious cases the attacks of ague are often persistently recurrent.

When congestion of the spleen goes to the extent of rupture, as has been the case in rare instances of low fevers, the blood passing into the peritoneal cavity, a fatal peritonitis is likely soon to follow, unless the hemorrhage and shock are sufficient to cause more speedy death.

Treatment.—The *treatment* of hyperæmia of the spleen consists chiefly in endeavoring to remove the conditions upon which it depends. The treatment of the cause of portal obstruction will often be called for, and the relief of the portal congestion by cathartics will generally be found useful.

The eradication of the malarial poison from the system, when that is the cause, will of course be required, and the prompt and thorough interruption of the aguish paroxysms is demanded.

There are some remedies which appear to exert a somewhat specific influence on the distended vessels of the spleen, diminishing their calibre and relieving markedly and speedily the size of the organ. Ergot is thought to have such an effect; but the most striking results are produced by full doses of sulph. of quinine. This effect is so marked, that Piorry was of the opinion that the action of quinine in diminishing the enlargement of the congested spleen was the mode of its operation in arresting the ague. That its action upon the spleen is not entirely due to its antimalarial effect is proven by the fact, that it speedily and notably diminishes the size of the organ when its congested state is dependent upon other causes than malarial.

A cathartic to unload as far as possible the portal vessels, and half a drachm or so of quinine, given in four or five doses in the course of twenty-four or thirty-six hours, will generally diminish the organ markedly and speedily, even when much hyperplasia is also present. Repeating this treatment once in a few days will often succeed in removing an enlargement which is great and has long continued.

Hypertrophy of the spleen, or fleshy enlargement—a hyperplasia of the organ—is commonly the result of long-continued congestion, or of repeated attacks of some form of malarial fever. It may occur, however, as the result of obstructed circulation through the liver, or from a slow inflammatory process in the spleen itself. The vascularity of the enlarged organ is so great, and the circulation of the blood is so active, that in some cases a venous hum, similar to that heard at the base of the neck in some cases of anæmia, may be recognized by applying a stethoscope over the tumor.

In some cases the spleen enlarges by an increased nutrition resembling the normal, producing increased structure apparently not very unlike that of the healthy organ. It is, however, a perversion of nutrition, as well as an increase, and the function of the organ is presumably impaired. When it goes on to an enormous enlargement, filling a large part of the abdominal cavity, there is anæmia, sometimes intestinal hemorrhage, and occasionally abdominal dropsy; but as the liver is generally also diseased at the same time, it is not easy to determine how much is due to the disease of the spleen, and how much to that of the liver, or, in fact, to disease of still other organs that may be affected at the same time.

Prognosis.—It is distinguished by the physical examination, and its course is uncertain. In ordinary cases dependent upon malarial fever, the prognosis under proper treatment is favorable, the enlargement yielding the more readily the less time it has continued; but in decided cases, a few weeks will generally be required to effect its complete removal. In some cases with great enlargement, and especially with serious hepatic complications, the prognosis is much more unfavorable; and even if the enlargement of the spleen be materially reduced in size, the patient may succumb to anæmia and general debility, or to hemorrhages and other systemic or local derangements. In one case under my observation, of enormous enlargement ultimately proving fatal, the proportion of white corpuscles in the blood from all parts of the system was increased, and the blood taken from the spleen with a hypodermic syringe had a much larger proportion of white corpuscles than that of the general system, and the red discs were very irregular in form. This case came very late under my observation and treatment, and though the size of the spleen was very notably diminished, and general improvement for a time occurred, a hemorrhagic condition succeeded, and the final result was as above stated.

Treatment.—The *treatment* of this enlargement of the spleen, as of congestion of the organ, will depend to some extent upon the cause which has produced it. That cause, whatever it may have been, should as far as possible be removed. As the hyperplasia is immediately dependent upon the hyperæmia, any treatment which will tend to diminish the latter will have a corresponding effect upon the former. This rational inference is confirmed by experience. No remedy within my experience has been so effectual in speedily reducing the size of an enlarged and fleshy spleen as full doses of quinine given in the manner directed for hyperæmia. A cathartic preceding is useful here, as in simple congestion, and other means directly to be mentioned have often great efficacy; but experience in repeated instances will not allow me to question the efficacy of quinine in those fleshy enlargements where hyperplasia is produced by a slow inflammatory process, or by other than malarial causes.

In addition to the free doses of quinine repeated once in a few days or twice a week, the ointment of the biniodide of mercury applied externally with friction and heated in, and of such strength and quantity as to produce considerable external irritation, aids very much the curative process.

In the intervals of administering the quinine, the iodide of potassium or the iodide of ammonium should be given. Of the iodide of potassium from eight to twenty grains may be given three times a day, if well borne by the stomach; and of the iodide of ammonium from three to eight grains may be given with equal frequency.

The fluid extract of ergot or the preparation called ergotine may be tried at the same time, or alternated with the other measures, or substituted for them, where for any reason they are not available. The fluid ext. of ergot may be given in doses of a drachm, more or less, three times a day, or the ergotine in appropriate doses either by the mouth or hypodermically.

Under whatever other treatment, the bowels should be kept well open; and in case of anæmia, some of the salts of iron may be required.

These means seldom fail to produce a decided effect upon common splenic enlargements, and very generally effect a cure.

INFLAMMATION OF THE SPLEEN.

Splenitis as an acute idiopathic affection is rare. It is not so rare as the result of embolism, pyæmia, or morbid growths.

Hemorrhagic infarction, followed by an inflammatory process, but not resulting in abscess, is occasionally found *post mortem*, and can sometimes be distinguished with tolerable certainty during life.

Embolic blocking of vessels is a frequent cause of circumscribed splenitis. The infarctions may be in the substance or periphery of the organ, and may vary in size and number—in size from that of a pea to a hen's egg, and in number from one to several. They are wedge shaped, and when near together may coalesce. They undergo the usual changes, ultimately resulting in suppuration. A limiting membrane may incapsulate the pus, or in its absence a ragged disintegrating pulp may constitute the wall of the abscess, and the pus will tend to make its way to the surface of the organ, oftener toward the diaphragm than elsewhere, and may be discharged through the bronchi. If it breaks into the peritoneal cavity, a fatal peritonitis is likely to follow.

If a patient affected with obstructive disease of the heart, or any affection likely to produce embolism, complains of chills, fever, pain, and tenderness in the region of the spleen, with moderate enlargement of that organ, this condition must be presumed.

A primary inflammation resulting in suppuration and very rare; but secondary abscess from pyæmia or septicæmia may occur in the spleen, as in other internal organs. Such inflammation would be intimated by the common local and general signs of inflammation, but a positive diagnosis might be impossible unless an abscess of sufficient size should form to give increased bulk to the organ and afford a soft or fluctuating tumor.

Treatment.—The *treatment* of such a case would not differ from that applicable to secondary inflammation and abscesses in pyæmic or septicæmic conditions, and this is described elsewhere.

The primary acute inflammations of the spleen will require the same treatment, essentially, as inflammation of the liver or the pancreas. Should there be a chill followed by an inflammatory fever, with pain and tenderness in the region of the spleen, a cathartic should be given, fomentations, or dry cups, or both, should be applied to the region; and if the pain and fever continue after the operation of the cathartic, six or eight grains of quinine with a quarter of a grain of morphine should be given, and the dose repeated once in from two to four hours, the quantity of morphine particularly being varied or omitted from the alternate doses, but sufficient being given to keep up a decided antipyretic effect of these agents for twenty-four or forty-eight hours.

If the symptoms should continue, a blister, and perhaps leeches, might be applied, the bowels kept well open by saline cathartics, etc.; and, if the inflammation still persisted, after two days the quinine and morphine might be repeated. This treatment, adopted early, might be expected to arrest or notably abate the inflammatory process.

Quinine is peculiarly adapted to the treatment of suppurative inflammation of the spleen, as it checks the production and migration of leucocytes, and diminishes particularly the amount of blood in the organ. Cathartics act by diminishing the blood pressure, especially of the portal vessels, and probably by a reflex impression also. If these means should not arrest the inflammatory process, either from its severity or because they were commenced too late, a more expectant plan should then be pursued.

The bowels should be kept open, severe fever abated, fomentations or poultices applied, the strength kept up, and the results awaited as in other internal suppurative inflammations.

Of eleven primary abscesses of the spleen collected and reported by Dr. Drake, the discharge of pus in six was by the bowels; in three externally; in one both externally and by the bowels; and in one there was no discharge of the matter. All but one recovered. Here, as in other diseases, the more favorable cases are likely to be reported, while the unfavorable ones, with perhaps an uncertain diagnosis, are not. A larger proportion of abscess of the spleen than these statistics would indicate, it might be feared, would terminate unfavorably if left to their own course. The aspirator, as in other cases of internal abscesses, particularly those of the liver, should be resorted to, and the same rules respecting an opening, with a more free incision when adhesions have occurred and the matter approaches the surface, should be observed as in hepatic abscess. (See Abscess of Liver.)

Chronic Interstitial Inflammation of the spleen, resulting in enlargement in some cases, and in contraction of the plastic exudate and atrophy, as in cirrhosis of the liver, in others, is not very infrequent. Its diagnosis may be obscure, but when discovered it should be treated as other chronic parenchymatous inflammations; and when enlargement is detected, by the same means already described for enlarged spleen. The biniodide ointment should be thoroughly used, and the iodide of potassium or the iodide of ammonium should be given perseveringly, the bowels kept free, and other symptoms attended to as they may arise.

Simple atrophy of the spleen may occur from different causes. Its diagnosis is difficult, and often impossible, and its clinical and therapeutical history is unknown.

The spleen is as liable to lardaceous, amyloid, or waxy degeneration as any other organ of the body, but is seldom so changed unless the liver and other organs are similarly affected at the same time. This form of degeneration is said first to affect "the minute arterial twigs and the cells external to them with which they are in relation."

The organ in this disease undergoes gradual enlargement, and in some instances attains a great size. But as the liver generally, and often the kidneys are also involved, the patient commonly succumbs before much enlargement occurs. *Post mortem* its capsule is usually smooth and glistening, and in the early stage the parenchyma presents an appearance to which the name of sago spleen has been given, when it is thickly studded with grayish, translucent, rounded masses resembling boiled sago grains, separated from each other by proper spleen tissue. Later these morbid masses have coalesced, and the spleen on section presents a nearly uniform aspect, all parts resembling the translucent grains of the earlier stage. It yields little or no fluid on pressure, and pits when pressed by the finger like a mass of stiff dough or wax. It is specifically heavy and is readily lacerated, resembling a lardaceous or waxy mass.

When this amyloid matter is thus diffused, the texture is rather firm, but it is easily cut, has a brownish or yellowish-brown color, and the pulp, the trabeculæ, the Malpighian bodies, and the vessels are all affected by it.

According to Prof. Eberth, of Zürich, not all the different nitrogeneous tissues are the seat of this amyloid deposit; it is not, however, confined in its consequences to the connective tissue group, but affects other tissues by compression and consequent atrophy. In the spleen it originates in the reticulated tissue, but not in the true gland structure. The test for this amyloid infiltration is Lugol's solution of iodine brushed over the part, which colors the tissues yellowish, and the morbid deposit red or reddish brown, but on addition of sulphuric acid, while the yellow color is not changed, the red becomes a dark violet.

This condition of the spleen is always associated with a depraved condition of the system—an anæmic cachexia, and often with dropsy and a hemorrhagic tendency. But, as before stated, this disease of the spleen is associated with a similar condition in other organs, and it is difficult to say how far the general symptoms are dependent upon the changes in the spleen.

The prognosis is very unfavorable, and the best mode of treatment doubtful. Iron and the preparations of iodine are generally prescribed, and a general tonic course seems to be indicated. Good hygienic regulations are certainly required.

Simple Cysts, and Hydatids, or echinococci, are sometimes found in the spleen, but usually at the same time in the liver and kidneys. When these are of considerable size the spleen presents an irregular enlargement; the course is usually slow, and always uncertain, and these cases require no special treatment different from that of similar affections of the liver. (See diseases of that organ.)

Tubercles may occur in the spleen, as in other internal organs, in general tuberculosis, but they can seldom be recognized during life, and require no special treatment different from that called for in tuberculous disease of other parts.

Cancer of the spleen is rare, and is very generally secondary—the cancerous growth extending commonly from the peritoneum. It usually occurs at different points in the organ.

No very distinctive symptoms are presented, and the diagnosis can only be made when an irregular tumefaction of the organ is discovered and the cancerous cachexia is present.

Palliative treatment, as of internal cancer elsewhere, is alone required.

DISEASES OF THE LIVER.

The size and position of the liver, its large development at a very early period of organic life, and the different functions it performs indicate its importance in the organism. In popular estimation its derangements have to do with a large portion of the common ills to which we are subject, and professional estimation gives this organ a conspicuous place in the physiology and pathology of the human system.

As observed by Dr. Murchison (whose admirable writings on diseases of this organ will be freely drawn from in what is to follow), in many respects modern investigation tends to the revival of ancient opinions. Galen taught that the liver was a blood-producing organ, and this view was held for a long time. The discovery of the lacteals, more than two hundred years ago, caused this organ to fall from its high position, and until comparatively recently its only function was supposed to be that of secreting bile. It is now well known that a part of the nutrient materials taken into the alimentary canal passes into the veins, and mingles with the blood without taking the course of the lacteals. It is also known that these materials passing through the portal vessels into the liver are acted upon in its vessels and substance. It is known that starchy, saccharine, and even albuminous substances, many of them first formed into glucose, are converted into glycogen and stored up in the liver for use; that this glycogen is capable of being formed into sugar and also into fat; and it is now believed to be capable of conversion into blood materials—of being appropriated to the formation of blood corpuscles—as it is shown that the blood passing out of the liver through the hepatic veins contains many more corpuscles—often five to ten times more, it is alleged, especially of white corpuscles—than it has when entering the liver by the portal veins. The red blood discs after leaving the liver are said to have sharper outlines, to be less likely to aggregate into rolls, and to be less readily dissolved in water than before they have passed through the organ.

This doctrine of the blood-producing function of the liver is confirmed by the fact that in fœtal life, when the liver is formed, a very active process of blood-cell formation is set up in it, and the production of these corpuscles greatly diminishes or ceases in other parts. It would seem that in adult life a part of the glycogen secreted or elaborated in the cells of the liver combines with nitrogen and forms a nitrogenized protoplasm, capable of maintaining the nutrition of the blood and the tissues. Fat is also believed to be from sugar, or the saccharine matter is changed into some other material which is afterward, either in the liver or elsewhere, converted into fat.

Not only is it thus shown that the liver is a laborator of nutrient materials fitted to supply the tissues, and a blood-producing organ elaborating corpuscles, but modern research has rendered it probable that it acts as a *blood-purifying organ*—not merely by secreting bile and thus eliminating effete elements, but also by disintegrating worn-out blood corpuscles and albuminous matters, forming them into urea and uric acid, and preparing them for elimination by the kidneys.

Albumen and fibrine are diminished in the blood as it passes through the liver. It is estimated by Brown-Séquard that 86¼ ounces of fibrine are daily lost in the liver—or rather, that this amount disappears from the blood while passing through the digestive organs, including the liver, and it is believed that most of this work is performed by the latter organ.

Assuming this to be the case, suspension of this action of the liver will account for the rapid increase of fibrine in the system which often occurs in rheumatism and other inflammatory affections ; but whether this is the true or the only explanation of hyperinosis cannot be regarded as established.

It is quite probable, at least, that while white blood corpuscles are formed in the liver, the worn-out red corpuscles are destroyed there —are disintegrated and changed into other forms of matter.

The bile acids have the power of dissolving red corpuscles out of the body, and they probably do the same with the worn-out ones, with low vitality, in the liver. The liver is certainly concerned in the formation of nitrogenous matter eliminated by the kidneys. Imperfect formation of urea is among the most constant signs of functional derangements of the liver ; and when this organ is in great part incapacitated by destructive organic disease, urea is greatly diminished in the urine, or it entirely disappears from it. In such cases, less oxidized azotized materials, as leucin and tyrocin, take its place. In further proof of the production of urea in the liver, it is not only found in free quantity there, but there is much more in the hepatic than in the portal veins.

The liver is probably not the only place where urea is formed; other glands may have a similar action ; and even the decaying blood corpuscles in the circulating vessels may change into urea, but it cannot be doubted that the liver aids in the process.

These disintegrating processes in the liver, as well as those that are formative, are accompanied with the production of heat ; and the healthy liver is found to be four or five, and even six or seven degrees

F. higher in temperature than the average of the blood in the system. The blood issuing from the liver in the hepatic veins is markedly warmer than that which enters it through the portal vessels.

These facts seem to show that the liver is a particular source of animal heat.

But another and the best known function of the liver is the secretion of bile. This material, according to the best estimates, is composed of water 859.2 parts, and solid residua 140.8, in 1000, on an average in a healthy state. According to the analyses the average solids of the bile consist of

Glycocholate of Soda Taurocholate of Soda	91.4
Fat	9.2
Cholesterin	2.6
Bile Pigment	28.4
Mucus	1.4
Salts	7.7
Total of Solids	140.7

in 1000 of the bile.

The yellow pigment is now called bilirubin. On standing it becomes oxidized and assumes a green color, and is then called biliverdin.

Bilirubin is formed from blood pigment or hæmoglobin in the hepatic cells, and this yellow bile pigment, when not excessive and in the physiological condition, is in turn converted into the coloring matter of the urine.

The process of transformation is—blood pigment, bile pigment, urinary pigment.

In a further analysis two bile acids are found—glycocholic acid and taurocholic acid. They are conjugate acids, the former being formed by the union of glycocol with cholic acid, the latter by the combination of glycocol with taurin. They are both derivations from albumen and contain nitrogen. Taurocholic acid gives the bitter taste to the bile, and contains the sulphur found in that fluid. As soda is in bile, these acids are in combination with it, forming the salts already mentioned as constituents of the solid matters of the bile.

Cholesterin is found in nerve matter, is supposed to be the débris resulting from nerve action, and is separated from the blood by the liver.

When this separation is defective, and the cholesterin is retained in the blood, it is supposed to cause a species of blood poisoning—cholesteræmia.

Whether some of these bile elements are found in the blood and tissues, and are simply separated by the liver, or whether they are formed in the liver by the combination there of other elements from the blood, is not quite settled.

Some are of the opinion that bile pigment is preformed elsewhere in the system and separated by the liver; but others deny this, and the most recent investigations seem to show that the change of materials of the blood to bile pigment occurs in the liver.

The distinction, made by Dr. Harley, of two forms of jaundice—one in which the bile acids are produced in the liver and reabsorbed, and the other in which the liver fails to separate the coloring matter from the blood—if the coloring matter, as well as the acids, is formed in the liver, is unfounded.

It is shown that jaundice does not result from extirpation of the liver in frogs, as uræmia does from removal of the kidneys. Nor does jaundice always occur, as it should if the bile pigment was preformed in the system, when extensive fatty or waxy degeneration of the liver takes place.

The quantity of bile secreted by the healthy human liver, when a proper free quantity of food is taken, is estimated at about forty ounces per day. But a small portion of this is ordinarily discharged from the bowels, and it must, therefore, be reabsorbed or changed into some other material. As there is no evidence of such conversion of this substance, it must be held to be reabsorbed either in the biliary passages or by the mucous membrane of the intestines.

There is, doubtless, a constant secretion and reabsorption, not only of bile but of other fluids, into the alimentary canal, and the purging of cholera or diarrhœa may be as much from the failure of absorption as from profuse secretion. It is indeed thought that all the watery portions of the blood pass several times, during the twenty-four hours, into the alimentary canal and out again into the vessels, and it is supposed that this continual outpouring and inflowing aids metamorphosis. It is thought that at least twelve pints of gastric fluid are secreted and absorbed in a day; the pancreas is believed to secrete the same amount; the salivary glands furnish about three pints in the same time, most of which is ordinarily swallowed; and the liver is supposed to secrete not far from the same amount; while the quantity secreted and absorbed by the intestinal membrane, independent of the stomach and these large glands, cannot be estimated. From the extent of the intestinal surface and the great number of small glands it contains, it is probably large. How many times the materials of bile are secreted, taken up, and go the rounds of the circulation in the system, we have not the means of knowing. In the course of the circulation much of the bile is probably converted into products which are eliminated by the lungs, kidneys, and other organs; and this whole process bears a necessary part in the purification of the blood, the assimilation of foods, and the sustaining of the system.

The bile has important uses in the alimentary canal. It materially assists in the emulsification and absorption of fat, as is proved by experiments upon animals and by clinical observations; and it probably also assists the absorption of albuminous foods. By its alkaline properties it aids in neutralizing the acids which pass from the stomach into the duodenum, and it precipitates the peptones; and, in short, the bile with the pancreatic juice, mingled with the gastric secretion, aids in the completion of the digestive process in the case of many articles of food. The presence of bile in the intestines seems necessary for the proper formation of glycogen in the liver. This may be by its action through sympathy, or by its chemical action on food elements. It also renders fæcal matters more soluble, and excites peristaltic intestinal action.

But a portion of bile is excrementitious, and passes off with the stools. The coloring matter, bile acids, and cholesterin, either in their proper characters as discharged from the liver, or changed in composition by their relation to other materials, are contained in normal excreta.

To briefly recapitulate the functions of the liver, it must be stated that no less than *three* somewhat distinct but complex processes are performed by it.

First. The formation of *glycogen* from alimentary matters, particularly from starchy and saccharine substances brought to it by the portal vessels, storing up this material in the hepatic cells, and giving it out, as required, changed into fat, sugar, and other substances, to contribute to the maintenance of animal heat, to the general nutrition of the blood and the tissues, and to the development of white blood corpuscles.

Second. The destructive metamorphosis, or the reducing to simple forms of albuminoid matters, whether from the food or the blood—the worn-out corpuscles, and especially the fibrine—forming from them urea, uric acid, and other nitrogenous products, which are subsequently eliminated by the kidneys, animal heat being produced in these changes in the liver.

Third. The secretion of bile, the greater part of which is reabsorbed, and subserves useful purposes in the system; and whi alimentary canal it aids in the assimilation of fats and peptones, it probably also assists those chemical changes referred to as going on in the liver, and aids the portal circulation. A part of the bile, however, is excrementitious, and in passing through the intestines it stimulates peristaltic action, prevents decomposition of the intestinal contents, and tends to produce a soluble state of the bowels.

These are all very important functions, they are, moreover, often deranged, and their derangements produce more or less serious consequences.

As a *blood gland*—a producer and purifier of the blood—as an organ of nutrition, elaborating materials for sustaining the organism—it holds a very high place, and one which, in these respects, has been too little understood or too often overlooked. It cannot be too strongly impressed that the liver, having other functions than the secretion of bile, embraces in its derangements other conditions than the diminution, the increase, and the altered character of that secretion.

From what has been stated respecting the secretion and absorption of bile, it is apparent that the amount of bile discharged from the alimentary canal is not a necessary measure of the amount secreted. It may rather indicate the amount not absorbed, for if less be absorbed while only the usual quantity is secreted, more will be discharged; and any cathartic medicine or irritating article of food, by increasing peristaltic action and thus preventing the bile from remaining a sufficient length of time in the intestines to be absorbed, will cause a larger amount of bile to be discharged without producing a real increase of secretion.

Irritation of an excretory duct of a gland usually increases the secretion of the gland. Taking a sapient or irritating substance into the mouth increases the secretion of the salivary glands, and a mote in the eye increases that of the lachrymal. So the irritation of cathartics upon the duodenum and the common duct of the liver and pancreas emptying into it, it is to be supposed, will increase the secretions of these glands, independent of any specific effect directly upon the gland itself. All this, however, does not render improbable the fact that some medicines have a specific effect, either through the blood or by a particular reflex action, in increasing and otherwise modifying the secretion as well as the excretion and extrusion of bile. This is a matter to be determined by experiments and clinical observations, care being taken to exclude errors and unwarranted conclusions.

From these physiological facts and considerations (and physiology is always the foundation of pathology) it is evident that derangements of the action of the liver may cause disturbance of a large portion of the functions of the body.

FUNCTIONAL DISEASES OF THE LIVER.

When the liver is organically diseased, its actions are of course interfered with ; but, independent of material structural changes, its functions may be deranged, and a great variety of morbid consequences may result.

As classified by Dr. Murchison, these derangements may involve :

1. Abnormal nutrition.
2. Abnormal elimination.
3. Abnormal disintegration.
4. Derangements of the organs of digestion.
5. Derangements of the nervous system.
6. Derangements of the organs of circulation.
7. Derangements of the organs of respiration.
8. Derangements of the urinary organs.
9. Abnormal conditions of the skin.

1. *Abnormal Nutrition.*—As the liver is concerned in the production of blood, we may have anæmia and spanæmia from its defective action. As it is concerned in the production of sugar, we may have an excess of that article produced in the system, constituting melitæmia or diabetes mellitus. As this organ is concerned in the production of fat, we may have obesity, or a deficiency of fat in the system from its wrong action.

If it produces too much fat, which is deposited in the general system and in the different tissues, there is inconvenient corpulence, with heaviness, weariness, especially after meals, shortness of breath, and often constipation, flatulence, and other dyspeptic derangements.

Often beer and wine drinkers, and sometimes spirit drinkers, become fat and gross. They are often said to be "bloated" with liquor, and they have a lowered organic structure, diminished power, and greatly diminished endurance. Such persons are more liable to diseases of various kinds, and when diseased they are "bad subjects"—do not bear well diseases or surgical injuries or operations.

The irritation of the liver by the alcohol induces hyperæmia, and in that state a morbidly increased fat production may result. In other cases, when the irritation of the alcohol is greater, the production of fat may be diminished, and emaciation in chronic alcoholism sometimes results. Bacchus was represented by the ancients as corpulent, never as emaciated ; but with the ancients alcohol was much diluted and used in the form of wine, not fortified by distilled alcohol ; and this is less likely to cause emaciation than more trated ardent spirits. Still, the wine and beer drunkard is sometimes thin, especially toward the last, though much more likely to have an excess of fat; and often, even though the fat diminishes, there are dropsical accumulations which produce a bloated condition.

When from any cause the liver is so far impaired in its function that too little bile is secreted and passed into the intestines to emulsify the fatty food, or to properly aid in the assimilation of albuminous matters; or when there is serious derangement of its glycogenetic function, emaciation will follow. When the glycogen is unduly changed to sugar, instead of being converted into fatty matter, it passes into the urine and constitutes diabetes. Emaciation, then, is the common result. In some cases of liver diseases the production of glycogen may be insufficient for the formation of the necessary quantity of fat, and thus emaciation may follow.

It is quite likely that in other wasting diseases, as in phthisis, the changes which so often occur in the liver contribute to the emaciation.

But derangements of the liver functions may lead to a deficient elaboration of albuminous as well as of fatty nutrient materials, and the wasting of albuminoid tissues, as well as diminution of fat, may result.

2. *Abnormal Elimination.*—Disease arises when the liver fails to perform its eliminative function. Such disease arises not only from retention of the elements of bile in the blood and tissues, but even more from a failure on the part of the liver to prepare materials which have become effete to be carried off by other organs, especially by the kidneys.

When blood corpuscles become old, having performed their functions for a sufficient length of time, and when tissues become disintegrated in the performance of their functions or from age, all these worn-out materials need to be prepared for elimination—require to be made soluble and carried out of the system. If they are retained, tissue and blood poisoning follow.

The ultimate form which these materials to the largest extent take is urea. Falling a little short of this more complete transformation, we have uric acid; and still short of this, a dark coloring matter resembling it is sometimes found in the urine; and leucin and tyrocin are other substances between worn-out tissues and urea. These substances, or still less changed effete matters, when retained in the blood (as from the imperfect action of the liver and in their less reduced state they are apt to be). produce more injurious effects than the retention of bile or bile elements.

Observations show that there may be large quantities of pure bile in the blood and tissues, almost to saturation, without serious consequences; and when "typhoid symptoms" occur in jaundice and in the latter stage of cirrhosis or acute atrophy of the liver, blood poisoning from the other matters referred to is more likely to be the cause of these symptoms than poisoning from the bile. However, large quantities of bile in the blood cannot be entirely innocent, and this secretion may undergo changes resulting in compounds which may be severe and fatal in their effects.

The symptoms caused by deficient excretion of bile into the intestines are irregular, usually costive bowels, though there may be diarrhœa; pale, clay-colored stools; loss of appetite; a yellowish or whitish coated tongue; a disagreeable, often bitter taste in the mouth, especially in the morning; a sallow skin and yellow conjunctivæ; depression and drowsiness after meals; languor and frontal headache; and in this jaundiced condition there are frequent deposits of lithates in the urine, and almost constantly the coloring matter of the bile and more or less of its acids will be found in this secretion.

These symptoms are commonly, and often at least properly, attributed to "torpor of the liver." They, at any rate, depend upon wrong liver conditions (though these are sometimes produced by obstruction of the excretory duct), and upon the morbid state of the blood consequent upon such wrong liver actions.

3. *Abnormal Disintegration.*—This is a matter not less important than deficient elimination, and it is intimately connected with it. Disintegration of albuminous matters is an important function of the liver, and a failure in its proper performance—a failure to convert effete albuminoid substances into soluble forms (urea, etc.)—produces morbid results that are often very serious.

This failure seems to occur in congestion of the organ, in fevers, and in more severe organic liver affections. As the result of overeating, or of taking improper ingesta—of imposing too much work on the liver—we have, besides impairment of organic actions in the tissues, from a want of proper renewal, lithuria—insoluble lithates in the urine, and more or less of effete matter retained in the blood and in the organs, deranging action in different ways.

The symptoms in such cases are feelings of weight at the epigastrium, flatulent and distended bowels, heart-burn and eructations, weariness and aching of the limbs, sleepiness after meals, a furred tongue, and a foul mouth. The appetite is variable; catarrhal secretions often occur; constipation with alternate diarrhœa is not unfrequent; there are frontal headaches and restless nights; and sometimes vertigo, dimness of sight, and other symptoms of general derangement.

In persons thus affected, though these uncomfortable s may lead to a desire for narcotic excitants, and may be temporarily relieved by them, yet any degree of alcoholic indulgence increases the ultimate morbid results. Any considerable indulgence in rich foods—oily and saccharine—also increases the symptoms.

Such patients, says Dr. Murchison, find that they must be careful of food and drinks. One first gives up malt liquors, and in succession port wine, Madeira, champagne, etc. He then tries brandy or whiskey largely diluted with water. "At last," quoting the words of Dr. Murchison, "unless he is misled by the fashionable, but to my mind erroneous, doctrine of the present day, that alcohol in one form or another is necessary for digestion, or to enable a man to get through his mental or bodily work, he finds that he enjoys best health when he abstains altogether from wines and spirits in any form or quantity, and drinks plain water."

Such a person, if he consults his interests, cuts off articles of rich food one after another, until he comes down to a plain, simple diet in moderate quantity.

This morbid condition, Dr. Murchison says, is extremely common in England, and Sir Henry Thompson, as distinguished in surgery as Dr. Murchison is in medicine, says, "few are aware of the great mischief which what is regarded as the moderate use of fermented liquors is doing in England." We have, continues Dr. Murchison, as the result of this state of things, gout, urinary calculi, biliary calculi, degeneration of the kidneys, structural disease of the liver, and, in fact, lowering and degeneration of tissue throughout the body.

With the approach to old age there is, in those indulging in alcohol, a tendency of the tissues throughout the body to undergo degeneration and decay; fatty and calcareous matter being substituted for the normal structures.

In corroboration of these views he quotes Mr. Barlow's article in the *Medical Times and Gazette* on the subject, Sir Henry Halford, Dr. Marshall Hall, Andral, Lobstein, and others of the highest authority in the profession.

Persons affected with this form of derangement, and addicted to these even very moderate alcoholic habits, are specially liable to local inflammations and constitutional diseases.

The influence of spirit drinking, not merely upon the liver and the nutrition, but especially upon the nervous system, in this country and wherever it is indulged, is too well known to all who without prejudice give the subject serious attention. The habit of drinking early in the day, and especially between meals, is, without dissent from any scientific source, regarded as particularly injurious; and so far from affording strength for bodily work, even temporarily, to one in the physiological condition, it weakens and deranges all real capacity; and the habit of indulgence after the day's work is done, though sometimes soothing the nervous system and promoting a kind of narcotic sleep, gradually perverts the general organism, and particularly the nervous system, and creates an appetite which too often seeks excessive indulgence, bringing with it all the moral as well as physical results of intemperance.

A full consideration of the subject of functional diseases of the liver would require a more extended account of the phenomena presented by different organs than the limits of this article will allow.

Some of the effects upon the digestive system have already been alluded to. The variable conditions of the tongue and the appetite, the bitter taste in the mouth, the flatulency, constipation or diarrhœa, the vitiated stools, intestinal hemorrhages, hemorrhoidal tumors, hepatic pains, jaundice, etc., might afford materials for more extended descriptions.

The effects on the Nervous System, the aching pains in the limbs, pain in the shoulder, hepatic neuralgia, depressing feelings of lassitude, severe cramps in the legs, headache, vertigo, and noises in the ears, sleeplessness, depression of spirits, irritability of temper, and the occasional more severe cerebral symptoms, convulsions, delirium, and a typhoid state, might all bear a fuller description.

The Derangements of the Circulatory System produced by this cause are not insignificant. Palpitation, fluttering and irregular action of the heart, exaggeration of the pulsation of the large arteries, intermissions of the pulse, feeble circulation, anæmia with its irregularities, and angina pectoris, might be mentioned.

Under the head of Derangement of the Respiratory Organs we have *chronic catarrh* of the fauces, chronic bronchitis, spasmodic asthma, etc.

Under that of the Urinary Organs are deposits of lithates and lithic acid, renal and vesicular calculi, bile, leucin and tyrocin in the urine, cystitis and various diseases of the kidneys.

The Diseases of the Skin which may be produced by derangements of the liver are numerous. Eczema, psoriasis, lichen, erythema, urticaria, boils and carbuncles, pruritis, pigment spots, etc., would be named.

It is not intended to be intimated that all the symptoms which have been named are the exclusive product of diseases of the liver; but derangements of this gland, which performs such very important functions in the organism, are often connected with the causation of all these affections; and not unfrequently by remedying the hepatic disease these symptoms will be removed.

JAUNDICE.—CHOLÆMIA.—ICTERUS.

By these terms is understood bile in the blood, in the tissues, and often in the excretions of the kidneys and skin, giving certain tissues and secretions a yellow color.

Although this is a symptom of various particular pathological states, it sometimes presents itself with sufficient distinctness of phenomena to entitle it to a separate consideration.

Etiology.—There are two leading varieties or classes of jaundice, with reference to causes, viz.:

1. Those dependent upon mechanical obstruction of the excretory bile ducts, or upon causes preventing the flow of bile, after its secretion, into the duodenum, its retention and consequent absorption; and

2. Those cases of the affection in which no such impediment exists.

The first class may be caused by foreign bodies in the ducts, such as gall-stones and inspissated bile, hydatids detached from the internal parts of the liver, or foreign bodies from the intestines. Obstruction of the ducts may be from inflammatory swelling of their coats or inflammatory exudates into them. The ducts may also be strictured so as to be practically obliterated by inflammation around them, or from congenital deficiencies, from ulceration and cicatricial contraction within them, or from ulceration of the duodenum. Tumors in the ducts, at their orifices or in their course, pressing upon them from without, such as cancers, hydatids, etc., may produce the result; and even spasmodic strictures are believed to be capable of producing temporary obstruction sufficient to cause the symptom.

All the cases of jaundice from these causes are organic, and, in strictness, should be excluded from the discussion of functional diseases of the liver.

The second class of cases are independent not only of those obstructions of the ducts, but, for the most part, of other appreciable structural changes, and properly come under the head of functional affections.

Jaundice, independent of these mechanical causes, may be produced by the poisons of various specific fevers, such as yellow fever, the malarial, relapsing, typhoid, typhus, and scarlet fevers. It occurs also from snake poison, from phosphorus, mercury, and copper, and occasionally from chloroform and ether used as anæsthetics. It occurs not unfrequently in pyæmia, sometimes in concussion of the brain, and even from intense mental emotion. In some of these cases there seems to be failure of power, deficient innervation in the organ, which interferes with the proper metamorphosis of the bile.

Deficient oxygenation of the blood seems sometimes to produce a jaundiced condition.

Excessive secretion of bile—more than can undergo the normal changes—and excessive absorption of it into the blood may produce jaundice. This excessive secretion may be produced by a moderate degree of irritation or excitement, and a hyperæmic condition of the organ.

Lastly, a condition of constipation, in which the excrementitious portion of the bile is retained in the intestines until there is absorption of materials not readily changed into other forms, may result in the accumulation of bile in the blood and the tissues, constituting jaundice.

The opinion seems to have prevailed among writers that mere *deficiency of secretion* is capable of producing jaundice, and that it is, in fact, a frequent cause of it. If, however, all the elements of the bile are formed in the liver, it is difficult to conceive how the accumulation of material in the blood and tissues can result from merely diminished secretion. We can readily understand that the disease may be produced by some deficiency of proper liver action, at least of the metamorphic or transforming power, if of no other; and it is well known as a clinical fact that medicinal agents which impress and apparently excite its activity, and which certainly increase excretion and discharge of bile, mitigate and remove the icterode symptoms.

Articles which have this effect are called cholagogues; and there are various articles which unquestionably have the effect of increasing the secretion and excretion of bile, and many cases of jaundice are markedly relieved by them. Especially are those cases promptly and decidedly benefited where the tongue is coated, the eyes and skin are yellowish, the urine loaded, the head heavy or painful, with a sense of weight in the region of the liver, and particularly when these symptoms come on rather suddenly, and where a malarial influence is present, or after rich food has been freely taken.

Pathology.—Prof. Frerich, of Berlin, whose writings, especially on the liver, are so well known, has given an explanation of the cases of jaundice not dependent on obstruction, founded, as he alleges, upon sufficient scientific observation.

This explanation is certainly ingenious, and seems neither irrational nor improbable. He says a large portion of the colorless bile acids found in the liver is either directly taken up into the blood in the hepatic veins, or is absorbed into the circulation after passing into the bowels. Under ordinary circumstances, these bile acids, a taken into the blood, become oxidized and assist in forming the large quantities of taurin found in the healthy lungs and in the pigment of the urine. These normal metamorphoses, however, are liable to be interrupted by nervous agencies, by poisons in the blood, and by other causes; and then these bile acids, not being sufficiently oxidized for conversion into taurin, are changed into bile pigments in the blood, and the result is jaundice.

In support of this view is the alleged fact that bile pigment can be produced artificially by the action of sulphuric acid upon the bile acids, and the much more conclusive fact, if it be established, that colorless bile acids injected into the veins of dogs are converted in their blood into bile pigment.

These experimental results are, however, still subjects of controversy, though the weight of testimony seems to be in favor of the conclusion that the bile acids undergo this transformation.

Dr. Murchison teaches that the absorption of the bile pigments, as well as the bile acids, is constantly going on, chiefly from the intestines; but that, under normal circumstances, its accumulation in the blood and tissues, in sufficient quantities to cause discoloration, is prevented by its transformation into other substances. When this transformation does not occur, jaundice is produced. When certain poisons are introduced into the blood, or certain influences are exerted upon the system, this transformation is perverted, and the icterus follows.

These methods of the production of jaundice are not inconsistent with each other, and jaundice may be produced in both these ways—by the transformation of bile acid into bile pigment, according to Frerich, and by failure of the transformation of bile pigment, according to Murchison.

Assuming either or both of these views to be correct, those medicines which increase the flow or excretion of bile, and speedily carry it out of the system, will prevent the absorption, to the same extent, of both the acids and the pigment, and consequently both the change of acids into pigment and the quantity of pigment unchanged will be less, and the icterode condition will be diminished or prevented.

If, on the other hand, the doctrine of Harley and others be true, that bile pigments are preformed in the system, in the tissues and the blood, and are merely separated by the liver, then those articles which increase the secretion of the liver will be indicated.

Whatever theoretical views may be correct or erroneous, the practical fact remains that the medicines which cause increased bile flow and discharge tend to prevent and relieve jaundice.

Most of the articles thought to be cholagogues are cathartics, and whether they operate entirely by impressing primarily the intestines, or by exciting directly the liver, the practical result is the same—bile is removed, and the jaundiced condition is mitigated.

Patients are accustomed to say (and this is acquiesced in by many physicians) that they are "bilious," that the "liver is torpid," and in chronic cases of ill health, that they have "liver complaint," and these expressions are often used without definite ideas of what they indicate. Indeed, the expression "liver complaint" is often used to cover ignorance, and to signify any general derangement the nature of which is not understood.

There is, in fact, with those most scientific in their methods and most careful and skillful in their diagnoses, much obscurity about functional diseases of the liver. There are no positive means of determining the extent, or even the fact, of excessive bilious secretion. The presence of bile in the stomach is only an evidence of regurgitation, and an increased discharge from the bowels may only show that less bile than usual is absorbed.

A jaundiced condition may indicate an obstruction of the bile ducts from any one of many causes, or from any one of the many functional derangements which have been pointed out. The different and conflicting pathological views that are entertained indicate obscurities and uncertainties on this subject.

It may be, after all, that jaundice, in those cases which are regarded as not dependent upon obstruction, is produced by spasmodic contraction and obstruction of the ducts, and the reabsorption of the bile from the mucous surface of the liver.

But notwithstanding these obscurities, there is much that is known or fairly inferred respecting even the functional diseases of this important organ, and it undoubtedly exerts a wide influence upon various morbid processes. A careful study of liver diseases is demanded of every practitioner, alike on account of their frequency, their importance, and their obscurity.

The relations of the urine with diseases of the liver is a subject of interest, and should be observed in the present light of chemical and microscopical science. Excluding diseases of the kidney itself, the condition of the urine is in many cases an excellent index of the liver action. In jaundice, especially from obstruction of the gall ducts, the urine contains free quantities of the bile acids as well as bile pigments, and its condition is a more positive evidence of the disease than yellowness of the skin, as the latter may be produced by other causes. In deficient action of the liver in preparing albuminous matters for excretion, there will be a deficiency of urea, and often a free quantity of leucin and tyrocin in the urine, indicating the imperfect transformations. When the liver produces an abnormal sugar, that article immediately manifests itself in the urine, and the amount of wrong action is measured by the quantity of sugar in this excretion.

In many of the derangements depending upon the wrong actions of the liver which have been pointed out, the liver is often said to be "torpid," with a degree of propriety. It certainly acts imperfectly. Mercury, podophyllin, euonymin, alkalies and salines are said to excite the liver. They certainly produce cholagogue effects: that is, they cause an increase of flow and discharge of bile; and they certainly in many cases of moderate jaundiced conditions remove speedily the symptoms.

Experiments upon animals, and especially those so carefully made and so fully and accurately reported by Dr. Rutherford, of Edinburgh, in 1878, tend to confirm the conclusions from clinical experience. Still, these experiments with dogs, by making a fistulous opening and inserting a tube into the excretory duct of the liver or the gall-bladder, ligating the duct below, forcing the flow of bile through the tube, and observing the amount discharged after the administration of various medicines, is by no means a conclusive test of the cholagogue and curative effect of these medicines in *human diseases* to which they are applicable. Of this no one is more fully aware than the judicious and careful experimenter—unless it be the experienced and closely observing medical practitioner.

Many experiments, with mercury for example, have been inconclusive and unsatisfactory; and especially so as the conclusions from them have been opposed by an immense amount of clinical experience.

The fallacies of the sweeping conclusions from these experiments will appear by considering the conditions of their performance.

In the first place, the effect of mercury upon the liver in its healthy condition may be different from that in its diseased states. The dog's liver experimented upon is supposed to be healthy, except so far as it is disturbed by the operation in producing the fistula, and this disturbance produces effects very different from those conditions which are present in the diseases for which the medicine is prescribed.

Medicines generally have different effects in health and disease, and also in different kinds of morbid conditions.

Again, an impression made upon the excretory duct of an organ, increasing its secretion, may be transmitted by *continuous* sympathy—the impression being conveyed along the duct. This mode of communication would be interrupted by the ligation and opening of the duct.

Again, an article which would stimulate the liver to an increased secretion might at the same time increase its absorbing and transforming function ; so that there might not be an increased discharge of bile though there was an increased secretion. Various metamorphoses of bile, as of other substances, doubtless occur in the liver ; and its greater activity under the influence of a medicine might consist in its effecting more of these changes, and in causing more rapid disposal of bile, as well as in its increased secretion. In this way the secretion of bile might be increased, while its discharge might be even diminished.

The liver, then, may be excited in its functions—mercury may have a specific cholagogue influence without producing increase in the discharge of bile.

Dr. Bennett's experiments, which have so often been referred to as showing that mercury has no cholagogue effect upon the liver, and that it is useless in the various bilious derangements for which it has been so generally prescribed, are at least inconclusive, if not completely valueless and misleading.

Moreover, the much more extended and much more careful experiments of Dr. Rutherford have tended to show that the bichloride of mercury, into which a part of the calomel and blue mass given is supposed to be converted, does markedly increase the liver's secretion and the flow of bile.

But clinical observations and experience must be the test of the activity and beneficial effects of mercury in liver derangements—on this the practical physician relies.

Causes.—The causes of these wrong actions of the liver are numerous.

When the structure of an organ is morbidly changed its function is of course deranged. The structural diseases of the liver will be considered further on.

Disorders of the stomach and intestines may cause functional diseases of the liver, and it is often difficult to say whether the liver derangement is primary or secondary. The results of imperfect stomach digestion—imperfectly elaborated materials carried by the portal vessels to the liver—may prove a source of irritation to that organ ; and this, in turn, by the disturbance of its functions, will react upon the whole organism, and often especially upon the stomach.

Constipation and other morbid conditions of the bowels operate in a similar way.

Diseases of the heart and lungs, by interfering with the circulation, affect this organ and produce in it wrong actions.

In all diseases attended by fever—symptomatic or idiopathic, specific or non-specific—the functions of the liver are disturbed. The liver seems to play an important part in the pathology of the pyrexial condition. It usually becomes enlarged during a fever, "its gland cells are swollen out with minute albuminous granules, and there is an increased disintegration of albuminous matter, and an increased production of urea, uric acid, and less oxidized products." This, however, can hardly be regarded as chiefly the result of a morbid action of the liver. There is a general increased disintegration of the tissues throughout the body, and the liver has to prepare this effete material for elimination. It has more than the normal amount of work thrown upon it, and its size is increased. Permanent derangement of the organ may be caused by an attack of fever.

The malarial poison doubtless acts upon the liver, independent of the fever phenomena which it also induces, and thus both directly and indirectly deranges its functions.

Primary functional diseases of the liver, as well as those dependent upon other diseases, may be produced by a variety of causes.

The first and most important of these is errors in regard to ingesta—to foods and drinks.

In England these errors among the higher classes are perhaps more common than among us; but they are exceedingly common everywhere, and in different ways among all classes.

"There can be no doubt," says Dr. Murchison, "that the present system of living, and especially the consumption of even what are regarded as average quantities of rich food and stimulating drinks, contributes largely to derange the liver."

When more food is taken than can be properly elaborated, the power of a strong organism may dispose of the surplus without material harm, but derangement is exceedingly apt to follow. If more is taken than can be digested in the alimentary canal, it proves a source of irritation there, and if more is taken into the portal vessels than can be properly elaborated by the liver, this organ is irritated by it; or if, passing on, more is taken into the lungs than can be properly oxidized, or more is taken into the general current of the blood than can be appropriated by the tissues, the labor of carrying the surplus out of the system is thrown upon the excreting organs, and much of this falls upon the liver. If the excreting organs are unable to carry off all these surplus materials, their retention in the system will produce general derangement, and not unfrequently hyperplasias of particular parts will result. Sometimes even worse and more speedy consequences follow from the chemical changes which these materials undergo, induced it may be by specific ferments producing poisonous materials.

If, in connection with too much food, an article is introduced which is either more or less than a food, which irritates tissues and checks normal metamorphosis and elimination, morbid results are still more likely to follow.

The liver is probably more likely to be deranged by these conditions than any other organ of the body.

Rich, saccharine, and fatty foods in excess are more likely to injure the liver than albúminous foods. Cooked articles having a large proportion of sugar and fats are more likely to do harm—are much more likely to derange the liver—than plain meats.

"But," says Dr. Murchison, "of all ingesta, the various alcoholic drinks are most apt to derange the liver. They do so in two ways: First, They may cause persistent congestion of the liver. Even small quantities of alcohol in healthy persons produce a temporary hepatic congestion; but if alcohol is taken in excess or too frequently, the congestion of the liver becomes permanent, and the functions of the organ are deranged. Like results may ensue from comparatively small quantities in certain persons. * * * Of course if the congestion be long maintained structural diseases may follow.

"But, secondly," continues Dr. M., "wines and other alcoholic drinks often cause derangement of the liver which a corresponding quantity of pure alcohol would not produce, and which, in fact, cannot be accounted for by any one ingredient of the offending liquid—neither by the free acid, the ether, the salts, gum, sugar, or extractive matter.

"This general rule, however, I believe holds good: that the injurious effect of alcoholic beverages upon the liver increases in direct ratio with the amount of sugar, plus alcohol, which they contain. * * *

"In accordance with this view, the alcoholic drinks which are found, from experience, to be most apt to disagree with the liver, are malt liquors of all sorts, but especially porter and the stronger forms of mild ale, port wine, Madeira, Tokay, Malaga, sweet Champagne, dark sherries, liqueurs, and brandy; while those which are least likely to derange the functions of the organs are claret, hock, Moselle, dry sherry, and gin or whiskey largely diluted."

This purely professional testimony from one standing among the very foremost men of the profession of his time, with all the influence of general custom operating upon him, and with such opportunities for observation as must have been enjoyed by a leading practitioner in London, should have much weight, and should cause those who advocate the general use of wine and beer as a measure of health and temperance, to examine the subject with more care.

The direct effect of alcohol on the brain is much the same in proportion to the amount used, in whatever mixture it occurs; and if beer and wine injure the liver more than gin and whiskey when largely diluted, it is difficult to see what is to be gained on the score of health by substituting wine for whiskey.

According to testimony from California, their strong wines are quite as injurious as whiskey, where the same amount of alcohol is taken. Most of the common wines of the continent of Europe contain but little alcohol, and are taken by the masses of the people with water, and frequently do little more than give a flavor to the water. Used in this manner their effects are slight; but where the stronger wines are taken with any freedom, the injurious effects are apparent there as elsewhere. The greater danger from the use of ardent spirits consists in the greater facility of getting a larger quantity of the alcohol. When the alcohol is taken in a more concentrated form, however, its irritating effects upon the liver are greater, as is shown by the larger number of cases of cirrhosis among spirit drinkers.

Another cause of functional disease of the liver is a deficient supply of oxygen. Oxidation is lessened by sedentary habits, by confinement within doors and in limited quantities of air. The circulation of blood through the liver is retarded by the same means. Active respiration promotes circulation and increases the amount of oxidation, and exercise promotes respiration. Want of exercise, therefore, is a cause of functional disease of the liver, and a very important one.

A high temperature favors certain functional derangements of this organ. The air is more rarefied when heated, and oxidation is not as perfectly effected. Less production of animal heat is required to keep up the temperature to the normal standard, and more work is thrown upon the liver to eliminate carbonaceous substances not burned in the lungs.

A high temperature tends to produce degeneration of liver tissue, causing in animals subjected to it minute granules in the secreting cells, similar to those sometimes produced by fevers.

Nervous influences may derange the liver. The brain and nerves control more or less all secretions, and in fact all functions, and the functions of the liver are not exceptions. Though the production of diabetic sugar takes place in the liver, there is believed to be a brain influence back of that which induces this wrong action of the organ. Prolonged mental anxiety, excessive mental exertion, change the action of the liver, inducing lithæmia and other morbid conditions, and sometimes even structural disease. If to these conditions of mental anxiety and excessive labor is added the use of alcohol and other agencies disturbing the liver, all the conditions are made worse.

Acute atrophy, gall-stones, and cancer are more frequent in persons who are subject to mental worry and fatigue; and it is believed that these are more than coincidences.

Another cause of functional derangements of the liver to be mentioned is a constitutional predisposition. This is not unfrequently inherited; and where such constitutional tendency exists, all other causes should be avoided. Care as to food, drink, exercise, etc., will be particularly required.

Lastly, various poisons derange the liver's action. The poison of alcohol, of chloroform and ether, of various mineral substances, of malaria, and other specific fever causes, have already been mentioned. Phosphorus deranges the liver's action, and has been thought sometimes to cause a disease resembling acute atrophy of the organ. Curare and other substances affect the liver by impressing the nervous system, especially the splanchnic nerves and the semi-lunar ganglia.

Besides these poisons taken from without, substances are often engendered in the system, from malnutrition, which act as poisons upon the liver.

HEPATIC CONGESTION OR HYPERÆMIA.

Congestion of the liver is a condition standing between functional and organic diseases, and partaking of the character of each. It is an increased quantity of blood in the organ—but that cannot occur without changing the function. It may be present without producing any other material structural change.

When moderate it changes the functional activity without materially modifying structure; but when great the organ is much enlarged, not only by distention with blood, but by the hyperplasia which follows; and many of the causes which have been mentioned as inducing functional derangements produce more or less hyperæmia.

Hyperæmia is also a condition accompanying most of the more decided structural changes.

Pathology.—Before proceeding to describe the treatment of functional diseases of the liver, a more particular account of its congestion will be given.

From the peculiarities of its vascular apparatus, and its anatomical relations to other organs, the liver is more exposed to hyperæmia than perhaps any other part of the body. With its double sets of capillaries, and its larger vessels destitute of valves, placed in such relations to the heart and lungs on the one side, and to the portal vessels on the other, dependent to some extent upon the pressure of the diaphragm above and the abdominal muscles below for aiding its circulation, it suffers passive congestion from every obstruction to the flow of blood through the heart and lungs, and from deficient action of compressing muscles.

On the other hand, its constant exposure to irritating matters which may be brought to it by the portal vessels renders it peculiarly liable to active congestions.

The quantity of blood in the liver varies normally. It is increased after a meal, especially if the food contains much fat and sugar, and still more if the meal is a large one.

Fluxion by augmentation of the pressure of blood from the portal vessels is observed physiologically only as a temporary condition during digestion, when these vessels are turgescent from gastric and intestinal absorption. The congestion becomes more permanent pathologically in great eaters and those habitually indulging in irritating ingesta which find their way into these vessels.

Suppression of menstruation or of an accustomed hemorrhoidal flux produces a compensatory distention of the vessels of the liver, as of other abdominal organs.

Irritative fluxions or more active congestions are very frequent. They may be produced by "traumatism" or by the results of injuries, and by inflammation and its products in other parts; from morbid matters found in the liver, and from irritating substances taken into the portal vessels from the alimentary canal; or from the absorption of poisons.

Many of the causes already referred to as changing the liver functions cause irritative congestion. Jaccoud mentions alcohol, spices, marsh miasm, dysenteric and typhoid poisons, phosphorus, lead, etc. He also speaks of fluxions of a nervous origin—from active mental emotions—fear or anger; from irritation of the spinal cord, electrization of the vagus, and section of the splanchnic nerves. Extirpation of the cœliac ganglia, as the experiments of Bernard and Frerich on animals show, causes very great hyperæmia of the liver, and curare and some other poisons produce a similar effect. Injury of the semilunar ganglia may cause fluxion; and *stasis* or passive congestion results from pressure *within* the inferior vena cava, by lesions of the heart, the pericardium, or the lungs, by feebleness of the heart or the respiratory muscles, by valvular lesions obstructing circulation, or by pressure *upon* the vena cava above the hepatic vein, or upon the hepatic vein itself, by tumors or other causes. This passive or venous form of congestion from obstruction above the liver causes a greater amount of distention than the active, irritating, and arterial form.

I have seen the greatest amount of congestion of the liver from capillary bronchitis occurring in an old asthmatic patient.

Morbid Anatomy.—Anatomically the liver is increased in volume without being changed in form. The surface is of a dark red or violet color; the peritoneal covering is stretched and glistening in severe cases; the vessels are dilated; but the hepatic cells are normal. As a result of the congestion, or a complication with it, the cells may present at certain points the first traces of an albuminous infiltration or of fatty degeneration. These alterations, however, are by no means constant, and according to Bamberger their relations to congestion are not clear.

In recent congestions the cut surface of the liver is uniform in color, but in those long continued it has a variegated appearance which has given it the name of nutmeg liver. This appearance occurs in obstruction—passive congestion—and is due to the fact that the central veins of the lobules are more distended with blood, and these parts are of a darker color, while the perilobular or interlobular veins are less distended, and the parts where they are found are of a lighter color.

When the stasis is from obstruction of the vena cava or hepatic veins, the radicles of these veins are distended, while the terminal branches of the portal vein are not materially affected.

Stasis of the bile, which sometimes occurs, may make this variegated appearance still more striking, as the bile colors most the portions surrounding the central veins.

This state of the liver so constantly follows chronic obstructive disease of the heart, that it has received the name from Jaccoud of "cardiac liver."

In more decidedly advanced stages the "cardiac liver" undergoes other changes which take the case out of the condition of simple congestion. In time the tissue begins to be atrophied and becomes granular, and may be mistaken for primary cirrhosis, hereafter to be described.

In the much advanced "cardiac liver" the hepatic cells disappear from the meshes of the dilated veins in consequence of their pressure upon them, while the peripheral ones remain intact.

The cardiac liver has not the hardness of the sclerotic liver of cirrhosis, which latter consists of hyperplasia, and afterward contraction of the fibrous structure of the organ, and consequent pressure upon its vessels, cutting off circulation and causing atrophy.

In cardiac liver the process is passive—a simple disturbance of circulation. In cirrhosis the process is an active one—is an interstitial hepatitis.

The stasis produced by cardiac disease extends not only to the sugar, that article immediately manifests itself in the urine, and the amount of wrong action is measured by the quantity of sugar in this excretion.

In many of the derangements depending upon the wrong actions of the liver which have been pointed out, the liver is often said to be "torpid," with a degree of propriety. It certainly acts imperfectly. Mercury, podophyllin, euonymin, alkalies and salines are said to excite the liver. They certainly produce cholagogue effects: that is, they cause an increase of flow and discharge of bile; and they certainly in many cases of moderate jaundiced conditions remove speedily the symptoms.

Experiments upon animals, and especially those so carefully made and so fully and accurately reported by Dr. Rutherford, of Edinburgh, in 1878, tend to confirm the conclusions from clinical experience. Still, these experiments with dogs, by making a fistulous opening and inserting a tube into the excretory duct of the liver or the gall-bladder, ligating the duct below, forcing the flow of bile through the tube, and observing the amount discharged after the administration of various medicines, is by no means a conclusive test of the cholagogue and curative effect of these medicines in *human diseases* to which they are applicable. Of this no one is more fully aware than the judicious and careful experimenter—unless it be the experienced and closely observing medical practitioner.

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The fallacies of the sweeping conclusions from these experiments will appear by considering the conditions of their performance.

In the first place, the effect of mercury upon the liver in its healthy condition may be different from that in its diseased states. The dog's liver experimented upon is supposed to be healthy, except so far as it is disturbed by the operation in producing the fistula, and this disturbance produces effects very different from those conditions which are present in the diseases for which the medicine is prescribed.

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Again, an impression made upon the excretory duct of an organ, increasing its secretion, may be transmitted by *continuous* sympathy—the impression being conveyed along the duct. This mode of communication would be interrupted by the ligation and opening of the duct.

Again, an article which would stimulate the liver to an increased secretion might at the same time increase its absorbing and transforming function ; so that there might not be an increased discharge of bile though there was an increased secretion. Various metamorphoses of bile, as of other substances, doubtless occur in the liver ; and its greater activity under the influence of a medicine might consist in its effecting more of these changes, and in causing more rapid disposal of bile, as well as in its increased secretion. In this way the secretion of bile might be increased, while its discharge might be even diminished.

The liver, then, may be excited in its functions—mercury may have a specific cholagogue influence without producing increase in the discharge of bile.

Dr. Bennett's experiments, which have so often been referred to as showing that mercury has no cholagogue effect upon the liver, and that it is useless in the various bilious derangements for which it has been so generally prescribed, are at least inconclusive, if not completely valueless and misleading.

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Causes.—The causes of these wrong actions of the liver are numerous.

When the structure of an organ is morbidly changed its function is of course deranged. The structural diseases of the liver will be considered further on.

Disorders of the stomach and intestines may cause functional diseases of the liver, and it is often difficult to say whether the liver derangement is primary or secondary. The results of imperfect stomach digestion—imperfectly elaborated materials carried by the portal vessels to the liver—may prove a source of irritation to that organ ; and this, in turn, by the disturbance of its functions, will react upon the whole organism, and often especially upon the stomach.

Constipation and other morbid conditions of the bowels operate in a similar way.

Diseases of the heart and lungs, by interfering with the circulation, affect this organ and produce in it wrong actions.

In all diseases attended by fever—symptomatic or idiopathic,

Treatment.—In attempting to prevent or relieve congestion of the liver, the causal indication must be observed and followed.

If of a passive form and dependent upon disease of the heart or the lungs, these affections must be treated according to their conditions. Radical treatment must be applied when there is hope of a cure, and palliative when the nature of the disease, as is too often the case, precludes such hope. These diseases and their management will, of course, require separate discussion.

When the hyperæmia is irritative and fluxional, dependent upon improprieties and excesses in diet, these errors must be corrected. Rich food, spices, and especially alcohol in all its forms, must be forbidden. The plainest, simplest diet sufficient to sustain the patient must be insisted upon. Poultices, counter-irritation by sinapisms, stimulating liniments, or, in severe cases, by blisters, will give relief to suffering. Leeches or cupping, dry or with scarification, according to the general state of the system, will tend to lessen pain and the congestive state.

A warm pack or warm bath will sometimes be very soothing.

The medicines most frequently required are *cathartics.* They unload the portal vessels, and diminish the amount of, or remove altogether, irritating matters that might otherwise be carried to the liver. They are rationally indicated, and experience proves their great utility.

No articles are better adapted to most of the cases than a mercurial—from three to eight grains of blue mass, or a few grains of calomel—followed in three or four hours by a saline purgative. The action of the different saline cathartics is very similar, but none of them are better in their effects than sulphate of soda. According to the experiments of Dr. Rutherford, it increases the secretions of bile more than any of the others. The purgatives should be repeated as required, but the mercurial must not be carried to the production of constitutional or salivating effects. A few doses only—often not more than one—will be required in the acute cases; and if the patient be delicate, anæmic, or particularly susceptible to impressions, the mercurial may be omitted. It is by no means essential to the treatment, but experience shows that more relief is obtained by this than by any other form of cathartic medicine.

In persistent cases other eliminatives besides cathartics may be required. Acetate of potash, in quantities of from one to two drachms in the twenty-four hours; or the citrate of potash or the carbonate of soda, in similar quantities, may be given.

Hydrochlorate of ammonia, in doses of from fifteen to thirty grains, repeated three or four times a day, is a favorite remedy with many. It seems to have a resolvent effect, when hyperplasia is suspected. Iodide of potassium or iodide of sodium may be used with reference to the same indication. Phosphate of soda is a favorite with some.

Various vegetable preparations have a reputation where slight icterode conditions are present. Podophyllin, leptandrin, euonymin, and iridine have been most used for that purpose. The podophyllin is a powerful cathartic, and is often severe and protracted in its operation when given in free doses. In smaller doses it appears to have a cholagogue effect, without irritating materially the bowels. Iridine, according to Dr. Rutherford's experiments, increases secretions from the liver, but irritates the intestinal membrane. Euonymin is reported by the same experimenter to increase the secretion of the liver without irritating the intestines, and the article is in favor with the so-called Eclectic physicians and others who have made use of it. It is given in doses of one to five grains, repeated a few times a day; and iridine is given in similar quantities.

If there is reason to suspect a malarious influence as a cause of the congestion, efficient antimalarial treatment must be promptly instituted. Nothing then is so efficient as full doses of quinine after the operation of a cathartic or two. The quinine, as a rule, should not be long continued, but a full antimalarial impression should be made. Indeed, independent of malarial conditions, quinine alone, in antipyretic doses, or in combination with morphine, and perhaps with the addition of atropine—as so often advised by Prof. Bartholow—will act very efficiently in diminishing hepatic congestion, and may avert an acute hepatitis. Eliminatives afterward will usually be required—the salines already mentioned being most efficient.

In protracted cases with debility, after proper elimination, the mineral acids—especially dilute nitric and nitro-hydrochloric acid—may be found useful. In debilitated or anæmic cases, preparations of iron and various bitter tonics may be added.

The nitro-hydrochloric acid baths have a reputation. As an example: ℞ Strong Hydrochloric Acid, ℥ij; Nitric Acid, ℥j. M., and add this to two gallons of water, to be used blood warm, as a local bath to feet, and by cloths to the region of the liver, night and morning. It should not be forgotten that although the course of medical treatment above imperfectly outlined is useful and often important, yet to avoid and remove if possible the causes is far more important. It should also be borne in mind that the causes which produce congestion, particularly irritative fluxion, if more severe or long continued, are apt to result in inflammation and other more serious organic changes, and these are to be guarded against in the treatment.

The *treatment* of more distinctly functional disorders of the liver remains to be considered.

It is doubtful whether in any case a purely functional disease exists—whether some degree of structural change is not always present.

At any rate, in these affections of the liver, the line is not always easily drawn between those that are regarded as functional, and those that are accompanied by slight structural changes. It is proposed here to treat of the management of those changes of function which are not known to belong to any particular structural changes.

In the treatment of those phenomena, consisting of or arising from abnormal disintegration and elimination, the proper regulation of hygienic conditions, and especially of diet, is most important. The diet should be plain and simple, as already advised in hyperæmia.

In habitual lithæmia the patient should avoid taking much saccharine and oily food—especially cooked dishes containing both sugar and fatty matter—and all highly seasoned dishes. He should take stale rather than new bread, plain mutton or other easily digested meat, white fish, soles, etc., poultry plainly cooked, eggs, and if agreeing well, milk, the last chiefly in the morning. He should be careful not to take a large quantity of farinaceous food, and should be very moderate in the use of vegetables. His drinks should be plain water, or diluents such as soda-water, or Seltzer water, or any of the saline natural waters.

Alcohol should be specially avoided. Dr. Murchison, whose experience in such cases has been large, says there is no danger to the nervous system from its sudden withdrawal, however freely and long it has been used, and that the sensations of "sinking at the stomach" and "craving" are kept up by its use.

A free supply of oxygen—of open, fresh, condensed air—is very important. The more free the supply of oxygen, the more will effete matters be burned up in the system.

Muscular exercise, as the strength and the condition will allow, is important; but according to Parkes it does not always materially increase the excretion of nitrogen. It, however, favors oxidation of all matters requiring that process, by favoring free respiration. It is generally agreed that sea-air is best. Nitrogenous and sulphur-holding tissues are more rapidly oxidized by it; and sea-bathing, if it can be borne, aids the process.

According to my experience the nitro-hydrochloric acid, given well diluted and in warm water, if it agrees better with the stomach, promotes oxidation in the system, and is particularly useful in those cases where a deficiency of this process results in the production of oxalate of lime, as indicated by its irritation of the tissues and its appearance in the urine. In the interior of our continent, and away from the sea, oxaluria has seemed to me more frequent than near the coast. My observations have been mostly made in southern Michigan and near the coast of Maine, and the contrast has been marked. In the mingled air of the pine forests and the sea, oxidation seems more active. But in these cases of deficient disintegration and elimination of effete matters, *aperients* and *cholagogues* are perhaps the most important medicines. They should, as a rule, be given whether constipation is present or not. Aperients bring away bile and redundant and effete products in the portal system. Salines eliminate most, and the natural waters of saline aperient springs are generally useful. Where the circumstances of the patient will not render these readily available, they may be imitated artificially. The salts of soda, potash, and magnesia are similar in their general effect, though each has its peculiar action.

These salts have little affinity for normal animal textures, and excite few changes in them. In moderate quantities they excite but little the peristaltic movements of the intestines, but by increasing exosmosis, they prevent the reabsorption of fluids so constantly poured out, and eliminate them from the system.

Whatever their mode of action, their beneficial effects are often striking. They should not, as a rule, or certainly not for any length of time, be given to the extent of producing active purging, but so as to keep the bowels free and the discharges thin.

Cholagogues are also useful. Among these mercury holds a prominent place. According to Murchison, and in the estimation of most practical physicians, it occupies a pre-eminent place. Says this writer: "The practical physician gives a dose of calomel, finds the quantity of bile in the motions greatly increased, and his patient's state much improved: he argues that the liver has been stimulated by the mercury to an increased secretion of bile, and that to this cause his patient's improvement is due. The physiologist, on the other hand, ties the common bile duct in one of the lower animals, produces a fistulous opening into the gall-bladder, and then finds that calomel has no effect on, if it does not diminish, the amount of bile that drains away from the fistula."

But these experiments, as has already been shown, do not justify all the inferences drawn from them. They are, moreover, contradictory. Although Rutherford did not find that calomel, while retaining that form, produced effects upon the secretion of bile in the dog, yet he found that corrosive sublimate did materially increase the bile flow, and the calomel is supposed to be transformed into that article —it certainly takes some form in which it is absorbed—before it produces its full cholagogue effect. But admitting that it does not always increase the secretion of bile, it prevents its reabsorption from the intestinal canal, and carries it away. Bile is increased in the discharges, and not only bile, but leucin and tyrosin are increased also, and doubtless various other excrementitious substances, the absorption of which would do harm.

Mercury, by increasing the *discharge* of bile, will lessen its amount in the system, and will also lessen the amount of disintegrated albu men circulating in the portal blood, and thus the loaded liver will be more effectually relieved than if the medicine merely stimulated the gland to increased secretion.

If mercury merely stimulated the liver, it might increase rather than diminish hepatic congestion. It may act upon the gall-bladder, gall ducts and liver in a reflex manner, by the impression made upon the gastric and intestinal membrane. The mode of its action is, to a large extent, a matter of speculation, but it does good in various diseases of the liver, in whatever way it accomplishes the result. Patients so declare, and so the physician observes. It often does what nothing else will in relieving a variety of gastro-intestinal and hepatic derangements. Undoubtedly the practice of taking large or small doses may often produce very injurious results. The effect of mercury, when in free quantities in the system, upon the tissues and the blood, is often exceedingly disastrous. It must always be given with caution, and in these affections should be followed by laxatives, to prevent its retention in the alimentary canal, and a transformation and absorption to a greater extent than is useful or safe. Large doses are unnecessary, and are occasionally injurious when happening to meet with agents in the alimentary canal which transform a large quantity into a soluble and active form. Even a fraction of a grain of calomel or blue mass, when well triturated with a considerable quantity of sugar, will often produce the desired effect, and a few such doses repeated at short intervals will often be better than larger ones given at once.

Occasionally, when inflammatory exudates are supposed to be deposited in the liver, the mercury may be repeated until some moderate constitutional effect is produced, short, however, of ptyalism. It tends to produce the disintegration of effused fibrine, rendering it more fluid, and promoting its absorption. In this way it may improve the functions of the liver when such inflammatory exudates interfere with them. An exact diagnosis is often impossible, and the good effects realized in some more protracted cases may depend upon this mode of its action rather than its direct modifying effect upon its functions.

That mercury, when applied to distant parts of the body, reaches the liver, is proved by its having been found in the bile of animals treated by mercurial frictions. Its effects in syphilis and various other conditions are undoubted, and clinical experience is overwhelming in favor of its use in various hepatic diseases.

Podophyllin is thought to act similarly, but it irritates the bowels much more, though it may be used as a substitute for it where, for any reason, there are real objections to the use of mercury.

Euonymin is worthy of further trials, and may be found to answer many indications. It has not yet been tested by the general profession.

Taraxicum has been recommended as a cholagogue of a mild character, and I have frequently used the fluid extract, as much for a vehicle in administering acetate of potash as for any well-defined therapeutical effects of its own, and have certainly realized good results from the compound in mildly jaundiced conditions, especially in malarious cases.

Colocynth, aloes, jalap, senna, and other cathartics, have more or less cholagogue effect, and may be used beneficially in various combinations.

Alkalies in various liver derangements are often useful. They are thought to promote oxidizing actions, and increase the disintegration of sulphur-holding materials. They effect chemical changes in the liver, often beneficially. They may, however, derange gastric digestion, and should not be too long continued. Even where they appear to be strongly indicated, their use must be suspended from time to time, and as a rule, in protracted cases, they should be combined with vegetable bitters.

Chlorine, bromine, and iodine are thought to increase oxidation in the system. The chloride of ammonium is thought to be preeminent for this purpose, where the liver is at fault. It has much reputation in India, where "sluggish livers" abound. Scruple doses three times a day improve the portal circulation and relieve many of these wrong actions of the liver. This article is very permanent in its composition, and may be used either with acids or alkalies. It is, however, thought to be unsafe to use it at the same time with considerable mercurial doses, lest it should convert the milder forms into the bichloride. The benzoate of soda, or better, the benzoate of ammonia, according to some recent observations, increases the secretion and flow of the bile, and in doses of fifteen grains three or four times a day has been followed by good results in deficient liver action.

The mineral acids—the nitric especially—are thought to have cholagogue actions. They affect the functional activity of the liver perhaps less than alkalies, but may be given after meals, aiding as they often do the process of digestion, while at the same time alkalies may be given after that process is completed and before the next meal is taken.

The more active tonics in these cases often disagree. Eliminatives frequently increase strength more than tonics, and are much more frequently indicated.

The chlorate of potash improves ultimate nutrition very often, and probably does so in part by its action on the liver. It is thought to aid oxidation, and in various low conditions of the system, with deficient glandular action, it produces a beneficial effect.

The use of nitro-hydrochloric acid, often for a long time, cannot be too highly recommended in those cases where oxalate of lime appears in free quantity in the urine.

Opium is generally contra-indicated in these functional diseases of the liver, and particularly when there is lithæmia. It diminishes oxidation, secretion, and elimination, constipates the bowels, and favors portal congestion. In diabetes, where there is excessive waste and elimination, it is often very useful. It probably modifies the action of the vaso-motor nerves of the hepatic vessels, a reflex paralysis of which is thought to be one of the causes of this disease. If anodynes are required, belladonna or hyoscyamus should be selected when the liver's action is deficient.

I am fully aware that comparatively more space has been devoted to the discussion of the confessedly obscure functional diseases of the liver than is usual in works of this kind ; and it is always more agreeable to dwell on subjects susceptible of more demonstration and admitting of less doubt. But the importance of the subject, and the brief manner in which it is discussed in many of the general works on the practice of medicine will, it is hoped, justify the course pursued.

Diseases of this kind are of very frequent occurrence almost everywhere, and especially in the south and west of this country, and their neglect leads to very serious results.

The object has been to state the principles, as fully as they are known or reasonably conjectured, upon which the treatment of these affections should be conducted. The details, and the adaptation of the various remedies to special cases, must be matters of judgment based upon the teachings of experience and such scientific knowledge as we possess.

The custom of some to attribute very vaguely and empirically almost every ailment to the liver has driven others to the opposite extreme of almost ignoring in pathology and therapeutics this very important organ. Even the importance of dietetic management is sometimes spoken of very lightly, and in some popular medical works the well and the sick alike, with but slight reservations, are advised to take whatever foods or drinks they may desire. Whatever mischief may be done by watching too closely the sensations produced by every article of food taken, and by too great restrictions as to diet (and mischief is unquestionably sometimes done in this way), infinitely more harm is done by disregarding proper dietetic and hygienic principles, following perverted appetites, and indulging in injurious habits.

Nothing has been more strongly impressed upon my mind by long observation and experience than the importance of observing hygienic regulations, not only as regards general and public conditions, such as proper sewerage, ventilation, pure water, etc., but private and individual conditions and personal habits as well. I have felt impelled, on what has been judged every proper occasion, to express, both by inference and explicit declarations, convictions so strongly felt.

Some, who recognize the importance of certain hygienic regulations, denounce or speak slightingly of medical interference in derangements of the liver and stomach.

A distinguished gentleman, who has done great honor to the literature of our country, who was educated in the profession, but who is a wit and a poet rather than a physician, has somewhere said, "When the tongue is foul, scrape and wash it and regulate the diet; to call in the aid of mercury and other drugs, is like calling in the police or a *posse comitatus* when a box of ashes is to be emptied." This is certainly witty, and, in reference to some cases of temporary derangement, is also true. But as a statement to be applied generally to cases of a foul tongue, it is far more witty than scientific. The police or the *posse comitatus* are often required to remove the cause, often very serious, of such a nuisance and index of evil as a foul tongue.

ORGANIC DISEASES OF THE LIVER.

There are various morbid changes which affect the structure of the liver. Some of these increase and others diminish its bulk, while others may do neither, but still may change its structural character. We have arrested development rarely; atrophy, contraction, and diminution of size, not very unfrequently; and enlargement often.

It may be enlarged by hyperæmia or congestion, as we have already seen. When this is the case the enlargement is generally uniform throughout the organ, and its smoothness of surface and proper proportions are preserved.

It is also enlarged by inflammation. As in other inflammations, the enlargement is dependent upon engorgement with blood, effusions of inflammatory products, and hyperplasia of tissue.

It is subject to a slow form of enlargement by hypertrophy, by fatty accumulations within it—"fatty liver"—by a waxy, lardaceous, or amyloid degeneration and accumulation, by cancerous and other morbid growths and deposits, by the development of hydatids, and the accumulations of biliary concretions; and lastly, its size may be increased by accumulation of bile in the gall-bladder, in the larger gall ducts, and in their minuter ramifications in the substance of the liver.

The liver may be diminished by simple, slow atrophy; by acute, or what is called yellow atrophy; by red atrophy; by simple induration; by a degree of degenerative change and contraction from long-continued congestion; and more frequently than from any other cause, by an irregular atrophied condition produced by a chronic inflammation and contraction of the interstitial tissue or the capsule of Glisson (cirrhosis).

These are structural changes which may occur, and are apparent by a physical examination. In order to detect such changes, a knowledge of the natural position and size of the liver is required.

The normal liver occupies the right hypochondrium, and extends beyond the median line into the left hypochondrium, and above it adapts itself to the concavity of the diaphragm. When the body is in the recumbent position the lower edge is so completely in the concavity of the diaphragm, that it is concealed by the lower part of the chest, excepting the left lobe, which lies uncovered by the ribs or their cartilages in the upper part of the epigastrium. The position of the lower margin varies, however, by the acts of respiration. In inspiration, when the diaphragm descends it pushes down the liver, so that in taking a full breath it may be felt just at or below the margin of the ribs, while in expiration it recedes again more fully under the walls of the chest. In the erect position its weight causes it to sink slightly in the abdomen.

We judge of the space occupied by the liver, and consequently of its size, by the area of dullness or flatness on percussion, and by palpation when below the ribs. It should be mentioned that without change in size the liver is sometimes changed in position and form. In women who lace tightly, especially if the practice is commenced in girlhood, and in a few other exceptional cases, the liver is found two or three inches or more below the margins of the ribs, and while it is increased in vertical it is lessened in lateral diameter, and a more or less deep sulcus may be produced in it by the wearing of a tight narrow belt about the waist.

The ordinary extent of percussion dullness in the right perpendicular mammary line, in adult persons of common size, is four inches, and the upper line of dullness is usually at the fifth interspace or the sixth rib. The dullness in the right axillary line is four and a half or five inches, and extends above the seventh interspace; and in the right dorsal region the dullness is four inches, and extends above the tenth interspace; and in the sternal or median line the percussion dullness is from three to four inches. There are slight variations from this, depending upon the size and conformation of the person ; and the line of dullness changes about an inch in full inspiration and expiration, and it is also slightly changed by the erect or recumbent position. The upper line of dullness is slightly curved, convex above.' This is a point of some importance in distinguishing between an enlarged liver and thoracic effusion, or a "spurious enlargement."

Congenital malformations of the liver are possible, but are exceedingly rare. All these marks then may be changed, but there will be no symptoms as the result of such malformations, and the conditions will be permanent.

The liver is proportionally larger in early life. In adults it is about one fortieth of the weight of the whole body. When the body weight is one hundred and sixty, the liver will weigh four pounds. Previous to puberty the proportionate weight is one thirtieth, and in young children it may be one twentieth.

The projection of the sternum and deformity of the chest called "pigeon breast," may give the appearance of enlargement of the liver ; and various diseases of the chest, chiefly effusion in the right pleura and very great effusion in the pericardium, may, by pressing the liver downward and increasing the area of dullness, deceive one who does not inquire into the history of the case and observe all the physical signs and rational symptoms.

In effusion the bulging is uniform, the upper margin of the dullness is usually in a straight line, and when the fluid is free in the chest the line varies with the position of the body, and the liver is not so much depressed by a free inspiration. In enlargement of the liver, more markedly than in effusion, there is eversion of the cartilages by pressure beneath them. Complications may render the diagnosis difficult. There may be a tumor, or a collection of fluid between the diaphragm and the liver, which may defy detection. Dropsy of the abdomen or the ovaries may lead to errors, but a careful examination in these cases will make the diagnosis satisfactory. Impacted fæces in the transverse colon may simulate hepatic enlargement ; the fæcal tumor, however, will usually be irregular and nodulated, and will often extend beyond the position of the liver ; but the most characteristic sign of fæcal accumulation is its susceptibility of indentation; and its disappearance on the administration of cathartics and enemas will be conclusive.

An abnormal condition of the abdominal parietes, rigidity of the muscles, or inflammation and swelling, may resemble liver enlargement. The tumefaction and soreness, however, will be more external, there will usually be tenderness, certainly if there be phlegmonous inflammation, and the general symptoms will be different.

Cancer of the peritoneum in the region of the liver may be confounded with tumors of that organ; and when adhesive conglomerations occur, the distinction may be very difficult.

Tympanitis could only deceive a superficial observer, as percussion would readily show the difference between distention from gas and that from a solid substance.

SPECIAL ORGANIC DISEASES OF THE LIVER.

As congestion of the liver has already been considered, a repetition would be out of place.

It may be remarked, however, that hyperæmia not only appears as a distinct condition, but also precedes and accompanies inflammations and other morbid changes; and as an accompaniment of other pathological states it must not be ignored. It will therefore be referred to in connection with other diseases, of which it constitutes a part.

HEPATITIS.—INFLAMMATION OF THE LIVER.

There are several varieties of inflammation of the liver, recognized anatomically and clinically. Besides the divisions into primary and secondary, and into acute and chronic, we have catarrhal, ulcerative, phlegmonous, suppurative, pyæmic, phlebitic, gangrenous, and plastic or adhesive inflammations.

CATARRHAL HEPATITIS.

By catarrhal inflammation of the liver is understood an inflammation of its mucous surface, or the internal lining membrane of the gall ducts and gall-bladder. That of the ducts has received the name of *angiocholitis;* and that of the gall-bladder *cholecystitis.* When the gall-bladder alone is inflamed, it is in nearly all cases due to calculi within it, or to inspissated bile. In other cases it accompanies inflammation of the ducts; but it is not always involved when they are affected. Catarrh of the liver has characteristics in common with other catarrhal inflammations, such as those of the stomach and bowels or the bronchial tubes. From the resemblance of the ramifications of the bile ducts through the liver to those of the bronchi through the lungs, the phrase "bronchitis of the liver" has been used as expressive of that resemblance.

The inflammation of this membrane may be primary and idiopathic, or secondary and symptomatic of other states, and the primary variety may arise from taking cold, from the influence of seasons (it is more likely to occur in spring and autumn), and as it occasionally appears epidemically, it may be supposed to depend upon some peculiar zymotic influence. The secondary forms may be due to calculi, to gastro-enteric catarrh extending to the gall ducts, or to other diseases of the liver and of other parts of the body. Jaccoud places alcoholism among the most frequent causes; and it sometimes complicates malarial and other forms of disease.

Morbid Anatomy.—The morbid anatomy is similar to that of inflammation of other mucous membranes. The surface is injected, turgescent, and covered with mucus from the hypersecretion which occurs; and this mucus contains epithelium, mostly in an embryonic state, mucine, etc., as in other similar catarrhal conditions.

The inflammation may occupy the mucous surface of the liver generally, including the gall-bladder, or any limited portion of it. Sometimes it is limited to the extra-hepatic portion of the canal, and the mucous accumulation may be confined to the duodenal mouth of the ductus choledochus. In duodenal catarrh it is not rarely the case that this duct is affected only at its extremity, but sufficiently to arrest the excretion of the bile. In that which accompanies the infectious fevers, this is sometimes the case. As the catarrhal inflammation subsides, the bile again freely flows; but if the condition be long continued, the liver ducts and gall-bladder become much distended, and atrophy of the liver substance may result from the pressure.

Symptoms.—This form of hepatitis is marked by the moderate febrile excitement usual in mucous inflammations, by some degree of tenderness on pressure, especially over the gall-bladder when it is involved, and by a feeling of weight and uneasiness, and sometimes of pain, in the region of the organ.

A general congestion of the liver accompanies this form of inflammation, and this, together with the swelling of the numerous tubes and the accumulation of bile in them so likely to occur, causes moderate enlargement of the organ, with a smooth, uniform surface as far as can be discovered by palpation.

The gall-bladder, however, is often so much distended as to be distinctly felt, or even seen, as a pear-shaped tumefaction below the margin of the ribs.

As the gall ducts become obstructed from swelling and from mucous or semi-plastic exudations, the bile is absorbed from them, producing in from two to three days decided symptoms of jaundice. The urine is loaded with bile, is of a dark mahogany color, and when tested, shows the presence of bile acids. The skin and eyes are yellow; and bile not passing into the intestines the stools are clay-colored. The bile acids may not be abundant in the urine, as they are readily decomposed in the blood when the system is in a proper state.

When the inflammation commences in the stomach or duodenum and extends to the bile ducts, as is often the case, there will be more tenderness of the epigastrium and greater disturbance of the functions of the stomach and bowels. Dyspeptic symptoms are usually present to a greater or less extent. There is a feeling of heaviness and sleepiness, the pulse often becomes slow, and other evidences of a general disturbance of the system occur. The bowels are generally constipated, but there is occasionally, though rarely, diarrhœa, and the stools, besides presenting the clayey or ash color belonging to all forms of jaundice, are often mingled with mucus discharged from the ducts. This condition constitutes the most common form of *acute jaundice.*

This form of disease, without very severe symptoms, may continue for several weeks, though it usually terminates in a shorter period.

Etiology.—Catarrhal inflammation of the liver is sometimes dependent upon some general cause—upon some zymotic influence or atmospheric conditions—as it occasionally prevails epidemically. Much oftener, however, it occurs sporadically, and is produced by the common causes of catarrhal inflammation, exposure to cold, checking perspiration, etc.; and not unfrequently the inflammation commences in the stomach and intestines and extends to the gall ducts. It is often complicated in its more chronic forms with other pathological conditions of the liver, and is dependent upon them. The presence of gall-stones in the ducts or the gall-bladder may be a cause; and pyæmic and septicæmic conditions may give rise to catarrhal as well as phlegmonous inflammation of the organ.

Diagnosis.—As in bronchitis or muco-enteritis, the usual exudate upon the gall ducts is mucus, but in rare cases it assumes a plastic or croupous character, and sometimes it is largely purulent.

The croupous variety can only be distinguished *post mortem,* and the suppurative form can be proximately diagnosed by the greater severity of symptoms, and the appearance of pus in the alvine discharges.

Catarrh of the biliary passages, before obstruction has caused jaundice, might be confounded with simple congestion, with the initial symptoms of acute yellow atrophy, and with catarrhal gastro-enteritis. After jaundice appears, it may be confounded with this condition arising from other causes—such as obstruction of the ducts from inspissated bile ; from impressions made upon the nervous system, or from various structural changes of the liver. A proper inquiry into the history of the case, and a comparison of the phenomena will render the diagnosis sufficiently certain to lead to correct principles of treatment.

Prognosis.—In the ordinary cases of hepatic catarrh the prognosis is favorable ; the inflammation subsides in a week or two, and the obstruction and its consequences disappear in one, two, or three weeks later. As the obstruction of the ducts is removed the bile passes off, the liver assumes its proper functions, the bile is reabsorbed from the tissues, and the health is restored.

Sometimes, however, resolution is delayed, and the case becomes chronic, while in rarer instances complete organic strictures are produced, and serious consequences to the hepatic structures result. Recent observations by Charcot and others have shown that mechanical blocking up of the ducts may lead to degenerative changes of the parenchyma of the organ. Interstitial hepatitis, increase of connective tissue, fibroid and fatty degenerations, and atrophy of the gland cells may soon follow. The changes may be more general, from obstruction of the main excretory duct, or local and in patches, from complete obstruction of smaller branches. These are serious and may be fatal consequences.

Treatment.—As there is hyperæmia of the liver generally, as well as inflammation of its mucous surface, the treatment will not differ greatly from that recommended for congestion of the organ. As, however, there is apt to be present a catarrhal state of the stomach, and especially of the duodenum, reference must be had to that condition also. When dependent upon gastro-duodenitis that state furnishes an indication for treatment.

The diet should be bland and moderate in quantity ; generally milk and farinaceous substances are best, and the simplest drinks only should be allowed.

Cathartics are much depended upon, but, as a rule, they should be of an unirritating character, especially when the membrane of the alimentary canal is involved. Cholagogues are suggested by the jaundiced condition, but articles to excite biliary *secretion* are not particularly indicated, as the jaundice is from the obstructed flow, and not from the deficient secretion of bile. To overcome the inflamis not easy to decide, since their effects are never speedy and striking, and the disease usually subsides of itself in a week or two, or three.

Whatever complications may be present should receive attention, especially the conditions of the stomach and bowels. When intestinal digestion is supposed to be particularly imperfect, and the bowels are otherwise deranged from the absence of bile in them, inspissated oxgall would seem to be indicated, and, according to Dr. Harley, is often very useful.

In Germany and France a course of the natural mineral waters, such as the Carlsbad, Ems, and Vichy, is advised where symptoms of a jaundiced condition linger. These waters are often doubtless useful, and artificial preparations may be substituted for them. When the appetite is not restored after the subsidence of other symptoms, and the patient remains weak, the bitter tonics and mineral acids may be found useful. Constipation must not be allowed·to continue.

The phosphate or sulphate of soda, in doses of a drachm or more three times a day, kept up while the jaundice lingers, will often serve a useful purpose. Euonymin and iridine taken at night, followed by a saline in the morning, are thought to be efficient in aiding the eliminative action of the liver. The benzoate of ammonia may be useful here, as in functional torpidity of the organ.

The diet should receive attention. Easily digested foods should be directed.

But the more permanent mechanical obstructions of the gall ducts by calculi, tumors, etc., and the management of the obstinate jaundiced conditions following, will be referred to hereafter.

Ulcerative inflammation of the ducts is not easily distinguishable, clinically. But when this occurs the case is more persistent and severe, and muco-purulent and bloody matter may be found in the discharges. The treatment of these cases will not differ materially from those already described. A tonic and sustaining course will be more likely to be required.

ACUTE PHLEGMONOUS AND SUPPURATIVE INFLAMMATION OF THE LIVER.

This affection, sufficiently defined by its title, may be primary and idiopathic, or secondary—dependent upon other pathological states.

SECONDARY HEPATIC ABSCESS.

Secondary inflammations and abscesses of the liver have often referred to, as the result of pyæmia from suppurations in surgical cases, in dysentery, in abscesses elsewhere, etc. Ulceration of the gall-bladder or bile ducts may lead to the same result.

Whenever pus or decomposing matter or small emboli obtain access to, or are found in any of the portal veins, they first come into capillary vessels and are likely to be lodged in the substance of the liver. These materials being in the veins of the systemic circulation are more likely to be lodged in the lungs, but may be in the liver as well. However introduced, their presence in the liver excites irritation, inflammation, and the suppurative process; and small circumscribed abscesses, often extensively scattered through the organ, are thus produced. The preceding conditions, the general symptoms of pyæmia: elevated temperature, repeated chills, free sweats, dry tongue, rapid pulse, depression, etc., together with the local symptoms of pain, often tenderness, and moderate enlargement, will mark the cases and lead to the diagnosis. Where the case is protracted sufficiently and the abscesses are few, they may become larger, presenting irregular bulging, and possibly fluctuations may be detected. Generally, however, the abscesses are small and scattered, many of them deep seated, and fluctuation or much bulging is not discoverable. When the abscesses are near the surface the pain and tenderness are usually marked, but if they are deep seated or central the pain may be slight or absent, and the tenderness obscure. When the inflammation extends to the peritoneal surface the pain and tenderness are much more decided, the breathing is likely to be short and thoracic, and the other symptoms of a local, or sometimes of a more general peritonitis are present.

More or less jaundice is often present, as the pressure of the abscesses is apt to interrupt the excretion of some parts, and cause absorption of the accumulated bile. As only a moderate part of the liver substance is usually involved, the portal circulation is not much interfered with.

In these cases of pyæmic or secondary abscesses the disease is very severe, the course is usually rapid, and the termination fatal. Sometimes cases are more protracted, and recovery may take place. Much will depend upon the extent and character of the original disease and the severity of the pyæmic symptoms.

These pyæmic cases are to be prevented, if possible, by attention to the primary conditions giving rise to them. Abscesses from which there is danger of the taking of pus into the circulation are to be early opened, antiseptic dressings are to be carefully used, and antiseptic medicines may be given internally.

Treatment.—In the treatment of pyæmic cases, no depletion is to be practiced; fomentations and poultices will tend to relieve the pain, anodynes may be given as required, and quinine, salicylic acid, carbolic acid, the sulphites, and perhaps mineral acids, as in other cases of septicæmia, may be used.

For the vomiting which is likely to occur, ice, effervescing mixtures, bismuth, carbolic acid, creosote, morphine hypodermically or on the tongue, and counter-irritation—as by sinapisms or small blisters—may be useful.

Beef-tea, milk, etc., must be given as can be borne; and if alcohol is given, it must be largely diluted or in the form of milk punch or with syrup and the yolk of egg.

IDIOPATHIC AND TRAUMATIC PHLEGMONOUS HEPATITIS.

Etiology and Phenomena.—Primary, idiopathic, phlegmonous inflammation of the liver occasionally occurs in high latitudes, but with much greater frequency in hot climates and seasons and in malarious regions.

An inflammation of the parenchyma of the liver tending to suppuration may occur in any climate, when excited by local injuries, by adventitious growths or hydatids, by extension of inflammation from the ducts or veins of the organ or from other neighboring parts, independent of pyæmia or embolism. Such an inflammation may also be induced by pre-existing congestions of the liver, produced by obstructive heart disease; or it may be excited by irritating ingesta.

An increase of the causes producing congestion may produce parenchymatous inflammation tending to suppuration.

It usually affects only a portion of the gland, the other parts remaining sufficiently free to perform function, and to allow of a fair degree of portal circulation.

Inflammation of the parenchyma of the liver affects mainly the connective tissue and the small vessels which permeate and sustain the proper gland elements. The vessels become dilated and engorged, and the blood contains a superabundance of leucocytes; inflammatory exudates are poured out infiltrating the tissue; embryonic tissues are developed in the walls of the small vessels and ducts, and the connective structure generally in the inflamed part of the liver. The proper liver cells become swollen and opaque, and are sometimes replaced by fatty or pigmental deposits. The appearance presented by the inflamed tissue differs in different cases according to the cause, the degree, the stage, and the peculiar kind of the inflammamation of the tubes, and thus remove the swelling, the effusions, and the obstruction, and to relieve the general portal congestion, are the principal objects of treatment. Moderate saline cathartics, with an occasional small dose of a mercurial, are useful, but they should not be carried to excess. A fraction of a grain of calomel rubbed up with sugar allays irritation of the mucous membrane, and is followed by beneficial results. When the tenderness is decided and the patient vigorous, leeches or cupping applied over the region will produce relief. Fomentations and poultices are also useful, but if the case is at all severe or obstinate, blisters will be found more efficacious. I have had no more satisfactory results from any treatment than from a good-sized blister over the region of the liver and the epigastrium, in cases of acute jaundice from catarrh of the liver. The use of alkalies, especially the carbonates of soda, tends to supply to the alimentary canal the alkalinity of which it is deprived by the obstruction to the flow of bile and pancreatic fluid through the common duct, and alkalies possibly do good in some other ways. But in whatever way operating, alkalies and salines are often prescribed, and are thought to be useful. Diuretics may aid the kidneys in carrying off the elements of bile from the blood and tissues, and should be used. Frerichs advises lemon-juice as a diuretic for this purpose. The saline diuretics are most used.

Diaphoretics may also aid elimination, and, as in other catarrhal inflammations, by determining to the surface they procure relief.

Quinine in full doses, especially when a malarial influence is present, will usually be followed by marked benefit.

It is a source of gratification to me that views long ago derived from my own experience, and for years past taught to successive classes, respecting the antiphlogistic effects of quinine, are of late corroborated by the statements of others high in the confidence of the profession. The recent work of Prof. Flint on Clinical Medicine, and Prof. Bartholow's Practice of Medicine, afford evidences of the advancement of American professional opinion in this direction. In the treatment of the early stage of this affection the latter says: "Whether malaria is or is not an element in the case, two antipyretic doses of quinia (10–15 grains) should be given daily until jaundice appears, and for a few days subsequent to its full development."

The propriety of continuing the quinine so long might be questioned, but the utility of its early administration does not, with me, admit of doubt.

Prof. Wagner, of Leipsic, advises the free use of buttermilk, and, as a domestic remedy, sour cider is sometimes used. Whether either of these and various other articles that are advised are really us[illegible]t is not easy to decide, since their effects are never speedy and striking, and the disease usually subsides of itself in a week or two, or three.

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Suppurative hepatitis resulting in abscess is circumscribed and intense. Suppuration, as in other abscesses, commences in the central point of the inflamed part, which becomes paler; embryonic cells make their appearance in large numbers ; the hepatic cells become granular and are disintegrated ; the connective tissue also liquefies and disappears ; leucocytes are poured out, and a collection of pus is formed. The surrounding portion of the gland is hyperæmic, and the suppuration and congestion may spread, involving a considerable portion of the organ. There are sometimes several foci of inflammation and suppuration, sometimes ultimately merging into one irregular cavity, in which hang filaments of tissue which have longer resisted the destructive processes.

The pus of a hepatic abscess varies in appearance, but is usually more or less mingled with bile, and is often of a glairy appearance and greenish hue. Idiopathic hepatic abscesses are usually solitary, though there may be two or more at the same time ; but when numerous, there is reason to suspect pyæmia as the cause. Pus from a primary abscess in the liver may, however, enter portal veins, and thus produce suppuration in different foci. Pus may also enter the hepatic veins, producing similar results, if the passage into the vena cava be obstructed. An abscess invading a hepatic duct may be discharged through the bile channels into the bowels ; or if the duct be obstructed, the pus may penetrate other parts of the liver, causing in like manner extension of the suppurative process in the organ.

An hepatic abscess may travel in various directions. When it comes to the surface of the liver, adhesions may form between the peritoneal surfaces, and the matter may be discharged through the abdominal parietes, or through the diaphragm into the pleural cavity, into the lung and through the bronchi, or more rarely into the pericardium. Or taking other directions the pus may be discharged into the stomach, the colon, or duodenum ; or adhesions failing to form. it may pass into the peritoneal cavity. In some more rare instances the matter may burrow and infiltrate tissues, or getting behind the peritoneum it may pass downward, discharging into the cæcum, the rectum, or vagina; or it may take the course of an ordinary psoas abscess. A firm membrane may sometimes encyst the pus, when it may undergo fatty, cheesy, or calcareous degenerations.

The *symptoms* accompanying an ordinary case of acute hepatitis are rigors, often many times repeated; fever, pain, and tenderness in the part, the pain sometimes extending to the shoulder; disturbed respiration, and frequently a moderate degree of jaundice. On physical examination, the liver will be found more or less enlarged, but not uniformly as in simple congestion, as the whole organ is not affected, at least to the same extent. When the inflammation involves the surface, the pain and tenderness will be more severe and sharp in character, and all the local symptoms better marked. While it is in the central portion of the gland the local symptoms will sometimes be very obscure. There will be more or less enlargement, but it may not be readily detected, especially when the posterior part of the liver is the seat of the disease. There will be a sense of weight and uneasiness, especially on pressure, or on a change of position; or in taking a full breath, but there may be no decided pain, or if occurring it will be dull in character; and the febrile and other general symptoms may be slight. In some cases chills and fever occur at regular intervals, simulating ague, especially when suppuration has taken place.

Diagnosis of pus in the liver is claimed to have been made by certain brain symptoms, and the results of aspiration, it is alleged, have confirmed the diagnosis; but the claim has not been substantiated by sufficient general experience to entitle it to confidence.

The inflammation may terminate in resolution, in suppuration, in induration, or in other structural changes, such as have been described. Resolution may occur within a few days, or at a later period; and suppuration may take place within a week, or at an indefinite period thereafter.

The evidence of resolution will be a subsidence, more or less rapid and complete, of all the symptoms; but often a degree of congestion and impaired function will linger for a considerable time. The symptoms of suppuration are often at first vague and obscure. There will, however, usually be some change in the character of the fever, it becoming more remitting, with occasional sweats, and sometimes with repeated chills. If it be extensive, there will often be extreme prostration, a feeble pulse, pallor of countenance, and profuse sweats, and sometimes complete collapse and death. When an abscess forms, if it is of considerable size and on the anterior part of the organ, the tumefaction will become more prominent, projecting below the ribs, and commonly presenting a somewhat smooth, rounded mass. As it progresses, especially if the abdominal walls are not thick or rigid, a sense of fluctuation may be distinguished. Wherever situated, the area of hepatic dullness will be increased, but if posteriorly or deep, the local bulging may not be perceived, and the anterior margin of the liver may be pressed down below the margin of the ribs, presenting a uniformity as in cases of simple congestion. When the left lobe is the seat of the disease, the abscess is more easily detected, though if it be deep and small it may escape recognition. When near the upper part of the liver, and to the right, it may press up the diaphragm and lung, interfering with respiration, and causing flatness on percussion as high as the right nipple, and even considerably above it. If more to the left, it may displace to some extent the heart. When it presses upon and involves the diaphragm, not only is difficulty of breathing induced, but hiccough and a hacking cough are likely to occur. The stomach may be pressed upon and displaced, and nausea and vomiting may be induced.

Although during the course of hepatic inflammation and abscess there is usually a fever which is readily distinguishable, the temperature seldom rises above 102° or 103°, and is sometimes but very slightly above the normal. In protracted cases the fever is apt to assume a hectical character, and chills, exacerbations of fever, and sweats sometimes occur with a regularity and severity simulating very perfectly an ague. The yielding of the fever to quinine only very temporarily, together with the local symptoms, and the more or less jaundiced condition so often present, will distinguish it from malarial fever. In some cases the digestive organs are but little disturbed, while in others, a coated tongue, nausea, vomiting, derangements of the bowels, etc., are marked.

Diagnosis.—The differential diagnosis in hepatic inflammation and abscess is to be made by observing all the phenomena which have been described. It should be distinguished from hydatids (which so far as a physical examination is concerned it may resemble) by its more recent history, by the greater amount of fever, tenderness, and pain, and the greater disturbance of the general system. The trocar, which may be required therapeutically in either case, may serve for the purpose of diagnosis. By its use in abscess, pus, and generally fragments of liver structure will be obtained, while in hydatid cysts a straw-colored serous fluid, containing the characteristic echinococcus hooklets, will be produced.

It should be distinguished also from inflammation and distention of the gall-bladder; and this may be done by observing the peculiar pear-shape, and the locality of the latter and its more elastic feel; and it is distinguished from abscess of the abdominal parietes by the manner of attack, the earlier appearance of tenderness and swelling when the disease is in the abdominal walls, by the characters of the general symptoms, and by a careful physical examination. Dr. Flint gives as a method, quoted from Ziemssen's Handbuch, for distinguishing an abscess in the walls from that of the liver, the following: Introduce a long needle into the abscess. The part above the integument will be moved by the diaphragmatic movements if the abscess be in the liver, and it will remain motionless if the abscess be not hepatic.

Primary inflammation and abscess is to be distinguished from pyæmic abscesses by the history of a preceding suppurative disease, and by the peculiar symptoms of blood poisoning in pyæmia.

An abscess of the liver pointing upward to the diaphragm may readily be confounded with a pleural abscess in the lower part of the right side, or with pleuritic effusion in that side, bound down by adhesions. The distinction can usually be made by observing the history of the case and by a careful physical examination.

Prognosis.—The prognosis in primary phlegmonous hepatitis is variable. It is far less dangerous than pyæmic, but when an abscess forms the case is one of much gravity, the course of the disease is apt to be protracted, and the result is doubtful. An external pointing and a discharge through the abdominal parietes would seem to be most favorable; but still perhaps as large a proportion recover where the matter finds its way through the diaphragm and lungs, and is discharged by expectoration. More or less impairment of the lung would follow, but where there is no consumptive tendency, this mode of discharge may be considered to be about as favorable as any other.

A discharge into the colon is rather favorable, while into the stomach it is less so, and into the peritoneal cavity it is very generally fatal. I have, however, seen one case where the pus from a large acute hepatic abscess was discharged partly into the colon and partly into the peritoneum, and still the patient recovered. The diagnosis could scarcely have been mistaken, as simultaneously with the sudden subsidence of a large fluctuating tumor below the right ribs, a free discharge of pus took place from the bowels, and a distinctly fluctuating fluid mass as suddenly appeared in the depending part of the abdomen, which very slowly disappeared. The preceding symptoms rendered abscess of the liver unquestionable. The patient was a vigorous farmer, of middle age; he was almost in a collapsed condition when the abscess discharged, and his life was despaired of for some time after; but scarcely any peritonitis was excited, and gradual improvement and final recovery resulted. This case must, however, be regarded as a most exceptional one.

Not only is death in this disease liable to occur from the accidents of the abscess involving other parts, but the patient may be worn out by the long continuance of the disease, and he is quite as likely to succumb to shock, to the impairment of functions, and to blood poisoning during the acute stage. Patients, however, sometimes recover from almost every condition accompanying this affection, and a case, however unpromising, should not be entirely despaired of. Recovery from encysted abscesses without discharge, where the size is not great, is probably not remarkably unfrequent. Some impairment of the organ will, however, remain, and subsequent hepatic disease is more likely to occur.

Treatment.—The early treatment of phlegmonous hepatitis tending to suppuration is of more importance than the later management of the abscesses, inasmuch as resolution may often be induced. An early diagnosis should therefore be made, if possible, and prompt attention given the case. The views derived from hospital and consultation experience as to the impossibility of arresting and aborting internal acute inflammatory affections, must not govern the practitioner who sees diseases in their early stages. When symptoms occur which indicate intense hepatic congestion and inflammation, when there has been a chill followed by fever, accompanied with pain and tenderness of the part, and the patient is full of blood, a venesection, or the application of wet cups or several leeches, will lessen the hyperæmia, and may materially aid in arresting the inflammatory process. A large poultice or fomentations afterward, or a warm bath, may contribute to the same end, and should not be neglected. At a somewhat later period a blister may be of material service.

But internal remedies are of still greater importance. The prompt administration of a purgative is usually required. It unloads the portal vessels, and tends to reduce the hyperæmia of the liver. A mercurial, followed soon after by a saline or a dose of jalap and cream of tartar, experience proves to be efficient and useful. Diaphoretics, determining the blood to the surface and eliminating from the numerous pores of the skin, relieve internal congestion, so important an element of the inflammatory process. Various sedative agents, as veratrum viride, aconite, etc., tend to the same result. Alkaline and saline diuretics are also useful in eliminating by the kidneys, and in abating inflammatory action. However, the prompt use, after the proper evacuations from the bowels, of antipyretic doses of quinine or salicylate of soda is more efficient in arresting the fever and other inflammatory processes, and will often effect a speedy resolution. The addition of morphine to the quinine will increase its abortive effect. The object of treatment at this early stage is to prevent suppuration, which is of such serious import. Treatment of this kind, judiciously managed, in cases where the disease is more advanced and where suppuration is inevitable, will tend to diminish its extent—a matter of the greatest importance.

But if evidences of suppuration have occurred, and an abscess is detected pointing toward the surface, poultices should be used and results awaited. Even in such cases, if the fever be high, the antipyretic effect of quinine or salicylate of soda will be called for, and the extent of the suppurative process will be likely to be lessened by the action of these agents.

Wherever the abscess is situated, the safety of the patient is promoted by the process of adhesive inflammation, which confines the pus within bounds and prevents its discharge into the peritoneal or pleural cavity. Spanæmics should therefore be avoided at this stage, and plasticity encouraged. Quinine continued in tonic doses, tincture of iron, acids, and a better diet will be called for. The bowels should be kept open, the symptoms treated as they arise, and the progress of events carefully watched. The patient should always be sent to bed as soon as symptoms occur; opiates may be given at any time, when there is much pain and restlessness, and when these do not interfere with the operation of cathartic medicines; and, as stated, they aid the effect of quinine and salicylic acid in their antipyretic and anti-inflammatory effects.

The question of opening an hepatic abscess is one of interest and importance. It is sometimes very slow in pointing. If it is approaching the surface, and the parietes of the abdomen are involved, and exudates are deposited in them, there is evidence that adhesions have formed between the peritoneal surfaces, and the probabilities are in favor of an external opening and discharge. When fluctuation is discovered at the most prominent point, and is so distinct as to indicate that the pus is already in the abdominal parietes, and especially if there be a blush of the skin, a tolerably free opening with a scalpel or bistoury should be made. If the abscesses are multiple, and do not communicate with each other, the relief will be less, but the opening is proper when the above conditions exist.

If, however, an abscess is detected, but not involving the abdominal walls, and if no evidence is afforded of peritoneal adhesions, the aspirator should be used, especially if some time has elapsed without there being evidence of the proper adhesions. Drawing off the matter with this instrument, and repeating the process from time to time, will give relief and lessen the chances of an internal discharge.

This is one of the improvements of modern practice, effected by ingenious mechanical contrivances.

When a free opening is made, antiseptic dressings will be proper, as in the opening of other abscesses; and the use of the drainage tube and washing out with antiseptic flüids, as with a solution of permanganate of potash (gr. i to ℥i), or a weak solution of carbolic acid, etc., as in other large abscesses, may be required. In chronic cases, during all these processes, supporting measures—quinine and other bitter tonics, iron, mineral acids, etc., with as nourishing and digestible a diet as possible—must be used. The same general course must be pursued when the discharge is through the diaphragm or elsewhere. In some cases eliminatives from time to time may be required.

NON-SUPPURATIVE PARENCHYMATOUS HEPATITIS.

In some cases of parenchymatous hepatitis suppuration does not take place, but the inflammation becomes chronic, with various more plastic exudates and structural changes. The early treatment will not differ from that described; but later, the iodide of potassium, hydrochlorate of ammonia, mercurials carefully used, blisters or setons, and a gentle tonic course will be useful.

Gangrenous inflammations of the liver sometimes occur. They are not positively distinguishable clinically, but may be suspected when there is great depression. The symptoms will of course indicate supporting measures, and as the cases are usually fatal, a *post-mortem* examination will clear up the diagnosis.

Suppuration at different points in the liver sometimes follows complete obstruction of the ductus communis from biliary calculi or other causes. Dr. Flint has observed in such cases thrombosis of the hepatic veins.

The treatment will be the same as in other cases presenting similar symptoms.

INFLAMMATION OF THE FIBROUS STRUCTURE OF THE LIVER.

Inflammations of fibrous structures are generally adhesive rather than suppurative, and this is the case in the liver.

Perihepatitis, or inflammation of the peritoneal covering of the liver, may occur. It will present the characteristics of local peritonitis, with perhaps some more disturbance of the liver's function. If the peritoneal covering of the intestines is not involved, there will be less necessity for avoiding cathartics; but otherwise the phenomena and treatment will be the same as in other cases of limited peritonitis.

INFLAMMATION OF THE CONNECTIVE TISSUE OF THE LIVER.—OF THE CAPSULE OF GLISSON.—CIRRHOSIS OF THE LIVER.—INTERSTITIAL HEPATITIS.—HEPATIC SCLEROSIS.

Inflammation of this stricture may be acute, but it is very generally chronic, or if more or less acute at first it becomes chronic, constituting the peculiar and not uncommon disease cirrhosis, or "hobnail" liver.

Morbid Anatomy.—The morbid anatomy of this disease has many interesting features, and requires a somewhat particular description, and a comparison with other forms of diseased liver structure which resemble it.

This, as is generally the case with inflammation of interstitial fibrous structures, is plastic. Embryonic cells appear in all the fibrous structures, but chiefly in the fibrous coats of the vessels, and in the fibrous tissues more immediately surrounding them. In this process the portal veins are particularly involved. These hyperplasias undergo conversion into cicatricial fibroid tissue, and, following the law of such tissue, gradually contract. This obstructs the circulation of blood through different vessels, but mostly through the portal veins, which causes portal congestion and its results. The nutrient vessels of the liver are compressed more or less—more at some points than others—and its nutrition is thus interfered with. The hepatic lobules are seldom implicated in the inflammation, but their surrounding connective tissue is involved, and contracts in the same manner as that of the capsule of Glisson surrounding the portal and other vessels—compressing, flattening, and producing atrophy of the cells, and causing more or less of them to disappear. Some of the liver cells, however, retain their integrity, at least for a long time, and more or less bile is secreted ; and as the smaller biliary ducts are not so much implicated, they remain pervious, the bile secreted is not as a rule retained, and jaundice rarely occurs.

It is a curious fact that this adventitious tissue, unlike cicatricial tissue generally, is itself fairly vascular, which contributes to such nutrition of the cells as occurs, and helps to keep up their function. The liver, surrounded by a fibrous structure which is involved and permeated throughout by a net-work of fibrous tissue undergoing these inflammatory changes and contractions, is compressed, its nutrition is diminished, and a general atrophy or diminution of the organ takes place ; but particular smaller parts being more affected than others, a nodulated appearance results, which gives it the name of hobnail liver. The color of some portions may be nearly natural, but for the most part it presents a pale and mottled yellowish color, and hence the name of cirrhosis of the liver has been given. The islets of yellow secreting tissue scattered through the organ and surrounded by the somewhat palish adventitious tissue, give the appearance of yellow peas distributed in a mass of grayish wax.

As this form of disease is almost always (and according to Murchison the genuine variety is invariably) induced by alcohol, especially by ardent spirits taken without much dilution, the name of "gin liver" has been applied to it.

In the earliest stage of the disease, when a hyperæmic condition exists, and the deposits and hyperplasia first occur, the liver is moderately and quite uniformly enlarged; but as the contraction takes place and circulation is cut off, atrophy results, and sometimes is extreme.

In tracing the pathological anatomy of this disease more minutely, it is found that in the first phase, as just stated, the volume of the liver is increased; and it is also increased in density. If the surface is now granulous, the number of projections is in inverse ratio to the volume of the organ, and they sometimes escape recognition. At this period of the disease, on cutting into the parenchyma, it is found not only hyperæmic, but impregnated with a viscous, bluish-gray matter, while normal tissue presents the appearance of more or less prominent islets. The color may be normal, or brownish, green or grayish, from fatty and pigmentary deposits.

The second stage is marked by induration, due to the more complete evolution of the connective-tissue hyperplasia, and often by the diminution and deformity of the organ. The structure is now firm, cannot be penetrated by the finger, gives resistance to the knife, is almost ligneous, and has an almost fibro-cartilaginous appearance. It grates under the knife, the cut surface has a glistening appearance, but shows some grayish and lardaceous patches, with streaks of yellowish substance formed by the surviving hepatic lobules.

Microscopic examination shows the grayish veins or streaks composed of connective tissue encircled by concentric zones of cell groups, often spindle shaped. Where the newly formed connective tissue is least the hepatic cells remain intact, while in other regions they are fatty, pigmented, or totally destroyed. The pigmentation is the result of biliary stagnation, which, from compression, occurs in points. Some of the liver cells may present amyloid infiltration. Most of the biliary canals are well preserved and are easily seen where the hepatic cells have disappeared. The branches and trunks of the vena porta are seen, and exceptionally there is observed in them a general thrombosis from stasis of the blood, but the intrahepatic capillaries are occluded and effaced where the cells are destroyed. The hepatic arteries may be dilated, and the branches may penetrate the newly formed connective tissue supplying its nutrition. The radicles of the subhepatic veins are obliterated, ending in fibrous transformations, and these vessels lose their connection with the portal capillaries.

The anatomical changes described finally lead to obstruction of the course of the blood in the portal and subhepatic veins, to stasis in the portal system, and derangement of the chyloportic functions, to derangement of the secretory function of the liver and its final suppression, and to equal derangement of the other functions of the organ in transforming nutrient materials, producing and purifying the blood, and in influencing the process of digestion and general nutrition.

Allied Conditions.—There are other forms of contraction of the liver resembling, but not identical with, true cirrhosis.

Passive hyperæmia from mechanical obstruction in the heart or lungs may cause hyperplasia, firmness of structure, and a granular state resembling cirrhosis, but the atrophy is more in the centre of the lobules, while in true cirrhosis it is more at the circumference. In this congestive form of disease the parts supplied by the hepatic vein in time become depressed, while the parts receiving the portal blood stand out as granules. In the early stage of this congestive change we have the "nutmeg" liver, later the atrophy is more general, many of the vessels become obliterated, and the disease resembles but is not true cirrhosis.

Another form of atrophy described by Murchison may present a nodular appearance, but the fibrous structure is not hypertrophied and contracted, and the liver is soft. This is not the true gin liver.

Another form of diminution of the liver arises from repeated attacks of perihepatitis, the peritoneal covering becoming infiltrated and covered by plastic material, which, contracting, compresses the whole organ, obstructs its circulation and nutrition, and causes atrophy. In this case it presents a dense, smooth surface, different from the "hobnail" liver.

Syphilitic Hepatitis produces a condition of induration with masses of gummata which have been changed into opaque, buff-colored, dense, tough masses, of various forms and size. This condition also resembles cirrhosis, but the diseased process usually commences at the surface of the organ and extends toward the deeper parts, the peculiar masses are imbedded in a dense adventitious structure which is continuous with the changed gummata on the one side, and with the normal tissue on the other, blending them together and preventing their ready separation. Some of these masses have cavities within them, and in some points fibrous or cicatricial structures are found without the gummata within them. Contractions and depressions upon the surface of the liver are often found; but this form of disease, in its cause and specific character, is quite different from the drunkard's liver.

In fibroid tumors of the liver, which sometimes are found, there will of course be nodulations, and often depressions or fissures resembling cicatrices; but a proper examination of a specimen will readily distinguish this pathological state from cirrhosis.

Again, in the chronic atrophy of Frerich, or the red atrophy of Rokitansky, the liver is lessened in size; but there are no nodulations or granulations of the outer surface, nor necessarily any thickening of the capsule. In this disease the secreting tissue is hyperæmic and bluish red, and the change is uniform in the organ. In this rare form of disease the adult organ has been known to be reduced to twenty-four ounces, and, as in other forms of atrophy of this gland, the small portal vessels are to a greater or less extent obliterated and portal circulation is obstructed. This condition is seen in some cases of chronic ague, and also in some instances of cancer of the stomach, and in ulcerative dysentery.

True cirrhosis, where alcoholism prevails, is more common than any of the other forms of atrophy of the liver. It is a chronic affection, usually extending over several years. Dr. Murchison makes two stages: The first stage, *before the destruction of the minute branches of the portal vein*; and the second, *after such destruction*.

Symptoms. The disease is insidious in its approaches, and in the first stage the symptoms are obscure. There is generally no [illegible] fever, and no phenomena in this early stage distinguishing it from the other conditions of incipient chronic alcoholism. There will usually, however, be disordered digestion, feelings of languor and depression, etc., which will be relieved by a dram, and this will encourage the patient to continue in his indulgence. He may never have been drunk, or specially incapacitated for his business, and may not consider himself an intemperate man. If he consults a physician for these symptoms, he is not likely to inform him of the full extent of his indulgence in his beverages, and may not be warned of the necessity of strict abstinence. I have not unfrequently seen cases where the symptoms gave the greatest reason to suspect the beginning of cirrhosis, and where the subsequent history proved the suspicion well founded, in which the patient had been professionally advised to continue the use of [illegible] spirits "to relieve the dyspepsia, and keep up the strength and tone of the system." The patient may have been urged [illegible] himself so closely to business, [illegible] society, [illegible] often [illegible] place himself in situations where the opportunity [illegible] temptations to indulgence were increased—some directions may have been given about diet, and some "tonic" prescribed.

Cases might be mentioned where complete abandonment of alcohol was urged, but where the patient intimated that "doctors differed," and indulged his inclinations until confirmed cirrhosis resulted. Patients will feel more justified in the indulgence when they find, as is frequently the case, that a temporary suspension of their accustomed dram increases their uncomfortable feelings, while resuming the indulgence produces temporary relief. In some cases, when the physician is applied to, there will be occasional vomiting, and a dull pain and slight tenderness in the region of the liver. A careful examination might detect a slight enlargement, and only simple congestion of the liver might be suspected; and this indeed might be the fact; but these symptoms occurring in habitual drinkers should excite suspicions of early cirrhosis, and demand the most strenuous efforts to avert the impending calamity.

In some cases the early symptoms are more marked. Acute congestion may be apparent. There may be some fever, very noticeable pain and tenderness in the liver, with more decided enlargement, and often with gastro-intestinal catarrh, accompanied by vomiting, purging, loss of appetite, etc. The gastro-intestinal symptoms may mask those of the liver, and absorb the entire attention of the patient and the physician, but such symptoms in a drinking person demand a careful investigation of the conditions of the liver.

In the first clinical stage the mode of invasion and the particular symptoms vary, but are divided by Jaccoud into three groups, viz.: symptoms of subacute hepatitis; of gastro-intestinal derangements; and dropsical accumulations. In the first mode of attack the initial phenomena are more marked. There is a dull pain in the region, increased size of the liver, and often icterus. This condition may persist for several months, but it is often varied by a more acute phase—by increased pain, some febrile movement, etc.; such attacks continue a few days and are followed by increase in the size of the organ, and a jaundiced appearance. The most frequent mode of onset is by the gastro-intestinal symptoms, slow and difficult digestion, tympanitis often, alternate constipation and diarrhœa, the latter often becoming persistent as the disease advances; and other not distinctly characteristic symptoms already spoken of. In many, perhaps the majority of cases, the earliest symptoms are so obscure as not to be recognized as indicating cirrhosis, until ascites, produced by the obstruction of portal circulation, makes its appearance. The second stage of Murchison has now occurred.

In this second stage of cirrhosis the symptoms are more clearly marked. Though there may be little or no pain or soreness in the region, the evidences of obstructed portal circulation are prominent. Congestion of the abdominal organs, generally increasing their bulk and giving rise to more decided derangement of their functions, will be observed; a moderate catarrhal inflammation of the gastro-intestinal mucous membrane is often present. The abdomen is often still more distended with gas, and at length with serum in the peritoneal cavity. The spleen, from its peculiar vascularity, generally becomes distended with blood, and this is followed by hyperplasia and more solid and very perceptible enlargement in at least one half the cases. It may, however, be sclerosed so as to prevent enlargement. There is enlargement of the superficial veins of the abdomen, especially on the right side between the sternum and umbilicus, in most of the advanced cases. Any pressure on the vena cava or hepatic veins which obstructs circulation may cause this, as well as obstruction in the liver. When the vena cava is thus obstructed, the lower extremities will be likely to be varicose as well. From the portal obstruction, hemorrhoids, hemorrhages, a more decided gastritis and enteritis may be produced, and sometimes pain in the liver; but pain is not a prominent symptom, and is often absent. A moderate jaundiced condition may occur in the stage of congestion and early inflammation as before mentioned; and in cases far advanced there is usually a persistent sallowness, but it is not great. In rare cases shortly before death there has occurred deep jaundice with evidences of blood poisoning—with purpuric spots, coma, and convulsions; but during the ordinary progress of the developed disease, if decided jaundice occurs, some complication should be suspected. Still, some of the bile ducts are occasionally obstructed, and a moderate degree of jaundice without any special complication may result. The urine is generally high colored, and often quite dark in appearance, because the coloring matter of the blood is not changed into bile pigment and excreted by the liver, but is separated by the kidneys.

The digestive functions are various; but whatever their apparent condition, there is progressive emaciation and debility, and the patient at length dies from exhaustion.

The most characteristic conditions and most conclusive evidences of cirrhosis remain to be more particularly noticed, viz., ascites without peritonitis, and diminution of the size of the liver, ascertained by the diminished area of its peculiar dullness on percussion. The congested condition of the abdominal veins gives rise to serous effusion in the abdominal cavity, sooner or later, in nearly all the cases. The peritoneal sac gradually becomes filled with a yellow serum, often to a great extent, and although the fluid may be temporarily diminished by purgatives and diuretics, or even by diaphoretics, or may be drawn off by paracentesis, it will accumulate again, and the dropsy is persistent. It is at first, and often for a long time, strictly confined to the abdomen; but when there is a large accumulation, from its pressure upon the iliac veins, secondary œdema of the legs and feet, and of the scrotum and labia, often results. It is distinguished from dropsy arising from obstructive disease of the heart, or from organic disease of the kidneys, by its being confined to the abdomen, and its extending to the lower extremities only as the result of pressure. The pressure upon the renal vessels may be followed by some albumen in the urine, but there will be no renal casts, unless there is a complication of kidney disease, which by the way is not uncommon.

Diagnosis.—The method of distinguishing the size of the liver, its natural dimensions, etc., has been sufficiently pointed out.

The diagnosis of cirrhosis is to be made by observing the phenomena described, and by the history of the drinking of spirits often but little diluted.

Murchison is explicit in the statement of his opinion, though all do not agree with him, that true cirrhosis is always produced by alcohol. Other forms of atrophy of the liver which have been referred to are produced by other causes; and they must be distinguished from this by the history of the symptoms and by the previous diseases and conditions.

It should be distinguished from suppurative phlebitis of the liver, which may present similar symptoms to acute interstitial hepatitis; but this is a rapid disease, death usually occurring in a few days. From cancer of the liver it is to be distinguished by exclusion.

Fatty liver sometimes occurs in drunkards, in great eaters who lead a sedentary life, and in some consumptives. But here the liver is sensibly enlarged, and the part presented to palpation is soft rather than sclerosed. Hydatid cysts, multilocular echinococci, and adenoid tumors may present some phenomena resembling sclerosis, but the aggregate symptoms are different, and in all the cases the liver is enlarged rather than lessened in bulk.

The dropsy of cirrhosis is to be distinguished from cardiac or renal by its being entirely or chiefly abdominal, while the other varieties are general, affecting the upper parts of the body as well; and also by the absence of other evidence of heart or kidney disease.

When atrophy of the liver arises from contraction of its peritoneal capsule, portal obstruction and its consequences may follow; but there will be the history of previous peritonitis, or acute inflammation in the region, and there may not be the history of spirit drinking.

In syphilitic atrophy there will be the history of syphilis, of chancres, and the constitutional symptoms of this disease.

When atrophy arises from long-continued passive congestion of the liver, from obstructed circulation through the heart and lungs, the evidences of disease of those organs will aid the diagnosis.

The "red atrophy" alluded to has usually a history of malarial poisoning, or of dysenteric or cancerous disease, and not that of alcoholism.

The ascites arising from peritonitis, acute or chronic, has the history of these conditions—has pain, tenderness, etc., preceding. Some cases of chronic peritonitis are produced by alcoholism, and sometimes it will be difficult to determine to what extent the disease of the liver is responsible for the symptom ; and when there is a large accumulation of water in the abdomen, the physical signs determining the size of the liver will be obscured. After paracentesis, should that be called for, the question of atrophy of the liver and its nodulated condition can usually be ascertained, and the diagnosis more fully made.

Prognosis.—The prognosis in this disease is most unfavorable. When fully developed, it goes on sooner or later to a fatal result. Its continuance depends upon the rapidity of its development, the symptoms it may produce, the complications that may arise, and the power of endurance of the patient. Several months usually elapse after decided symptoms present themselves, and sometimes a few years.

Treatment.—The physician is seldom consulted in the early stage of this disease, and if he is, it is usually for other symptoms than those necessarily pointing to the liver, and the diagnosis is therefore not often made sufficiently early to render treatment of permanent avail.

If a patient, habitually indulging in alcohol to any considerable extent, complains of nervousness, dyspeptic symptoms, and failing strength, cirrhosis should be suspected, and every means resorted to to prevent its results. It should be understood that it is not so much occasional drunkenness, with periods of comparative or entire abstinence, as daily continuous tippling which produces this and many other alcoholic affections. The moral effects of excessive, periodical, and frequent drunkenness may be much worse; but, if there be intervals of sobriety, the physical effects are not so serious as where constant free indulgence is practiced, though positive drunkenness may never have occurred. This can never, from the physician's standpoint, be too clearly presented or too strongly impressed.

In the treatment of a case developed or suspected, the causal indication is the first to be fulfilled. The alcohol must be stopped. But the taste and the habit, hereditary or acquired, are usually already well established, and it is generally difficult to effect the reform. From the numerous cases of reformation produced in the habitually intemperate by associated efforts, we should, however, be encouraged to hope for the success of professional persuasion and authority.

Not only should the alcohol be cut off in all its forms, but the *diet* should be regulated; spices and rich dishes should be avoided, and a plain and simple, but sufficient, diet should be ordered. The desires of the patient should be consulted and indulged within certain bounds, but those bounds should not be beyond a simple and reasonable diet. Exercise in the open air should be enjoined. This is very important, as all experience and analogy show. The bowels should be kept free by saline laxatives. Small doses of cholagogues may be useful, and the alkalies or their salts, with organic acids, may properly be prescribed. Mercurials are recommended by Jaccoud, and may be proper where the alcoholic cachexia is not too far advanced.

In this stage of a slow inflammatory action, when the embryonic cells are forming into adventitious tissue, I do not doubt that iodide of potassium, in decided and persistent doses, tends to check and remove such conditions. Should it derange the stomach or produce any injurious effects, they should not be overlooked; but it can generally be well borne in doses of from five to ten or more grains three times a day, and, as this disease is chronic, the remedy must be chronic also. The iodide of ammonia may be used as a substitute, with some bitter infusion, should it agree better with the stomach. Should there be great nervous irritability, bromide of potassium might be given at the same time in appropriate doses, or substituted for the iodide for a time. Iodine frictions may also be applied over the liver, or some other form of counter-irritation used. After a time, and especially in debilitated cases, the syrup of iodide of iron may be prescribed. Iodine ointment, especially if enlargement is still the condition, should be persevered with.

Stillingia has been recommended in this stage of cirrhosis, but it has not sufficient reputation in this disease to be spoken of with any degree of confidence.

Prof. Bartholow expresses confidence in a "group of remedies which have a selective action on the liver, the metals chiefly, gold, silver, copper, arsenic, mercury, and phosphorus, which have the property of improving the nutrition of the liver, if used in a small quantity for a long period. The most efficient are the chlorides of gold and sodium, the corrosive chloride of mercury, Fowler's solution, and phosphorus in the form of phosphites or phosphates."—(Practice Med., p. 150.)

When the stomach is irritable he advises two drops of Fowler's solution, with two to five drops of tinct. of opium, t. i. d. In other cases the chloride of gold and sodium one thirtieth of a grain, or corrosive sublimate one sixtieth of a grain, as often. The facts upon which these opinions are based are not given, but the well known effects of mercury in small doses long continued render it credible that it may modify the morbid nutrition of the organ, and tend to remove the fibroid plastic material which is produced in cirrhosis. Experience and analogy would lead us to hope for more beneficial effects from iodide of potassium and from mercury, and the alterative effect of these articles may be tried in the early stages of this disease.

When much contraction occurs, no known treatment will avail in removing the pathological state. The object of treatment then should be to check the rapidity of the morbid processes and increase the endurance of the system: in other words, to prolong life and make it as comfortable as possible. The appetite and digestion should, as far as possible, be conserved and improved, and an easily digested and sufficient dietary allowed. Tonics, in some cases, may be useful, such as quinine, iron, nux vomica, mineral acids, etc., according to the indications. The bowels should be kept well open, and an occasional purgative will often procure relief and be well borne.

If a diarrhœa is present, and is severe and exhausting, it may be checked by appropriate remedies, but the dropsical accumulations are more rapid when the bowels are confined.

For the ascites hydragogue purgatives are the most efficient medicines, but they often debilitate too much, and are not well borne in feeble conditions. Diuretics may also be used, such as juniper, broom, digitalis, squills, cream of tartar, etc. Fomenting the liver with an infusion of digitalis has been recommended, and some advise the use of muriate of ammonia, both with reference to its diuretic effect and its action on the liver.

When the breathing is seriously interfered with by the pressure of the fluid, tapping must be resorted to, and may be repeated as required, but it should be delayed as long as possible, as after the fluid is drawn off it accumulates with greater rapidity, and the strength often seems to be more rapidly reduced.

Hemorrhage from the stomach or bowels, so likely from the congestion to occur, should be treated as already advised in cases where the blood flows from capillary vessels. Quiet, anodynes, astringents, and especially ergotine hypodermically, are indicated. The loss of blood may be so great as to prove fatal, but sometimes patients regain a comfortable degree of health for a time, after even a free loss of blood.

Hemorrhoids and other conditions due to this disease must be treated according to their indications. By careful and judicious management life may sometimes be prolonged for a comparatively long period; and I can but believe that if treatment be instituted sufficiently early, a curative effect may not unfrequently be realized. At least a decided effort should be made to prevent its development in those cases where it has not commenced but is threatened.

In more acute or subacute cases of interstitial hepatitis, early antiphlogistic measures may be resorted to: cups, blisters, salines, cathartics, diaphoretics, etc.; later, iodide of potassium or bromides, with iodine ointment externally. In more gradual cases, besides the hygienic regulations, milder antiphlogistics and eliminatives will be required. The nervous system, when it is much disturbed by withholding the alcohol, may require to be managed with opiates, chloral hydrate, and bromides, together with salines, iodide of potassium, or minute doses of mercury, as may be borne; iodine externally, and sometimes tonics later, will be useful. As much exercise in the open air as can be well taken is always important.

When a decided alcoholic cachexia is present with this local disease the case is most discouraging, scarcely admitting of even palliation. The retribution for the folly of such indulgence in the use of a delusive poison is then sure. Not only the liver, but the kidneys, the lungs, the brain, and other organs, may be in similar perverted conditions.

HYPERTROPHIC CIRRHOSIS.

A morbid anatomical condition of the liver under this title has lately been more particularly described by Hanot, Charcot, and others, and requires here a brief notice. Its causes have not as yet been clearly established, and unlike the atrophic variety just considered, it is not proven to be dependent upon the use of alcohol. In this condition, as its name implies, the liver is enlarged, sometimes to twice or even three times its normal size; is less nodulated upon the surface than the hobnail liver, and retains its normal form, with its sharp anterior edge. It is said to be extremely dense in texture, and its interior is largely infiltrated with dense, grayish, slightly translucent connective tissue. It does not constitute a distinct net-work, but is a diffused growth in which portions of hepatic parenchyma are scattered irregularly in small yellowish masses. In some parts there is more, and in others scarcely any, of the natural structure of the liver. and what there is varies in color from orange to green.

The fibroid growth in its minute structure does not differ materially from that in ordinary cirrhosis, but it commences from the interlobular branches of bile ducts which occupy the periphery of the lobules.

Commencing here, the portal vessels are at an advanced period involved, and many of the lobules are attacked and destroyed. The affected ducts, instead of being compressed by contracting exudate, are thickened and dilated, though the smaller branches are often blocked up with thin accumulated contents. The liver cells are atrophied, colored with biliary pigment, and often fatty. In this form of disease the ducts, notwithstanding their enlargement, are chiefly obstructed by the fibroid growth, and not the portal veins, as is the case in atrophic cirrhosis. As a consequence, the portal circulation is less obstructed, while the gall ducts are more blocked up.

The symptoms differ from those of ordinary cirrhosis and correspond with the anatomical states. Instead of portal congestion and its consequences—ascites, hemorrhages, etc.—there is jaundice occurring early in the disease, becoming decided and continuing throughout its course.

This icterode condition is followed by all the concomitants and results of chronic persistent jaundice. The disease is one of middle life, is slow in its progress; there are the usual derangements of the gastro-intestinal organs, gradual emaciation and failure of strength, with the blood poisoning of other forms of jaundice, and the final failure of vital functions.

One case, judged to be of this disease in an advanced stage, lately came under my observation. It soon after terminated fatally, but an autopsy could not be obtained. The patient, a man in middle life, had long been accustomed to a rather free use of alcoholic drinks, was profoundly jaundiced, the liver was markedly enlarged, and some ascites was present. He was anæmic and greatly debilitated, and no treatment produced any beneficial effect.

The sanction of professional authority cannot as yet be given to any particular course of treatment in a disease so insufficiently observed.

From what is known of its pathology and symptoms, the treatment in the early stage should not differ materially from that applicable to atrophic cirrhosis, and later the jaundiced condition will call for eliminative as well as supporting measures.

Syphilitic hepatitis, already referred to, may occur either in children from inherited syphilis, or in adults as secondary to the acquired disease.

In the earlier stages of the deposits of gummata and the hyperplasias following it, before the conversion of the latter into fibroid contracting tissue, the liver is enlarged, and the condition resembles hypertrophic cirrhosis more than the atrophic form ; but, as the disease advances, it resembles more the latter. The symptoms vary ; sometimes there will be jaundiced conditions, and at others more evidence of portal obstruction; and the general functions of the liver will be impaired in proportion to the extent of the parts involved. There is usually more pain in the part than in ordinary cirrhosis, and there will be a combination of the syphilitic and the hepatic cachexias. Besides the symptomatic treatment called for by the disturbance of the liver's condition, the antisyphilitic treatment—iodide of potassium and mercury—is demanded, as in other forms of secondary syphilis.

Fortunately cases of this kind are not frequent, even in syphilitic patients, and they will seldom occur to one in an ordinary practice.

ACUTE YELLOW ATROPHY OF THE LIVER.—MALIGNANT JAUNDICE.—TYPHOID ICTERUS.

This is a rare, obscure, severe, and generally a rapidly fatal disease, accompanied with decided symptoms of jaundice, and evidences of failure of the various functions of the liver.

Its causes are obscure. It occurs more frequently in women than in men, and is often connected with pregnancy or the puerperal state. It occurs also in some dissipated and syphilitic patients, and is said to be more common in rather early than in advanced life. The typhus and malarial poisons have been thought by some to have to do in its production.

Symptoms.—Its *symptomatic phenomena* are marked, though not uniform. Its attacks are frequently abrupt, but in some cases are preceded for some time by gastro-intestinal irritation and moderate general indisposition.

Among the first severe symptoms are vomiting of coffee-ground, hemorrhagic material, intense headache, and great restlessness. Delirium, low and muttering, or noisy, and sometimes even maniacal, with insomnia, succeeds. There is agitation and tremulousness, and often convulsions appear, either local or general—sometimes mere rigors, and at others, epileptiform or tetanic. Soon this condition of excitement and agitation passes into one of quietness and stupor, and this deepens into profound coma, generally with dilated pupils and stertorous breathing. The pulse during the excitement is subject to remarkable variations in frequency ; but as coma sets in it is more uniformly rapid, and gradually diminishes in force until it can no longer be felt at the wrist. The tongue becomes coated, and at length dry, brown, or black, with sordes upon the teeth. There is often uneasiness and tenderness in the hepatic region; and a careful examination will show more or less diminution of the area of hepatic dullness. The bowels are usually confined, and as the disease advances the discharges, when induced, are free from the color of bile.

The urine becomes loaded with bile elements, and its urea and phosphates diminish or entirely disappear, to be replaced by leucin, tyrocin, and extractive matters, which sometimes form a greenish-yellow sediment. The skin is often cool and dry; and the jaundiced discoloration, which may precede, accompany, or succeed the more violent symptoms, becomes marked, but seldom attains a very high degree of intensity. Two remarkable features are worthy of special notice: a total absence of febrile temperature, which is said to be frequent; and a general hemorrhagic tendency. The latter is shown in the hæmatemesis already mentioned, in petechiæ and extravasations of blood beneath the skin, and by hemorrhages from the nose, bowels, and other mucous surfaces.

The termination is almost uniformly fatal, and may occur within twelve or twenty-four hours; but usually it is between the second and fifth day from the occurrence of severe symptoms, though it is rarely delayed beyond a week. These remarkable phenomena indicate the suspension of the liver functions which were enumerated in the preliminary remarks on liver diseases, and illustrate the important character of those functions.

Pathology.—The *morbid anatomy*, which is striking and characteristic, shows such rapid and extensive changes in the liver structure as are incompatible with hepatic functions, and confirms the view of the varied functions and important office of this organ in the system. *Post mortem* the liver is found quite often of nearly its natural size, but usually it is much shrunken, often to one half and even to one third its proper bulk, with the surface wrinkled and flabby. Internally it is of a pale yellow color, without evidence of vascular injection, and with scarcely an indication of its constituent lobules. The bile ducts and gall-bladder contain little or no bile, showing that its secretion had been suspended. On examination with the microscope, the secreting hepatic cells are found to have almost or entirely disappeared, and in their place are deposits of granular matter and oil globules, with some bile pigment. Leucin and tyrocin, which the liver has failed to change into urea, are sometimes found in the hepatic substance and the hepatic veins. Other organs are sometimes found affected, but not to a great extent. The spleen is usually somewhat enlarged; occasionally some fatty change has occurred in the glandular epithelium of the kidneys; extravasations of blood have taken place under the surface of the peritoneum, pleura, and pericardium, in various mucous membranes, and sometimes in the lungs, liver, spleen, and kidneys; and chemical examination shows large quantities of leucin and other excretory matters in the blood.

Whether the lesions of the liver are primary, or the result of some general blood disease, is not positively established; but there seems little ground to doubt that the severe and fatal symptoms are chiefly due to the hepatic lesions, and Bright and Frerich regard those lesions as primary. That they are the most essential elements of the disease seems quite clear. The cause of these lesions may be the absorption or development of some noxious substance in the blood allied to those producing septicæmic or infectious fevers, and these may produce morbid effects upon other parts as well as the liver; but the disease of this organ is still the great cause of the results which follow. Whether the change in the liver is strictly an inflammatory process, or whether morbid changes different from those of inflammation occur, is not so clear; but that some inflammatory phenomena are present appears from the rapidity of the changes and the products which are found. The probability of the essential inflammatory character of the disease has appeared such as to cause the term "General Parenchymatous Hepatitis" to be applied to it; but whether this designation without much qualification is justified, is a matter *sub judice.*

The prognosis, as already intimated, is exceedingly grave, indeed is generally regarded as fatal. The earlier stages are more or less irregular in their duration, but the last stage follows a more uniform course. After the jaundice the rise of temperature and the insomnia supervene, and life very rarely continues a week. Five days is about the average period.

Treatment.—The treatment of this malignant form of disease is exceedingly unsatisfactory. Various remedies have been recommended and tried, among them active cathartics in the early stage, the local abstraction of blood and other antiphlogistic measures, and it is possible that benefit has arisen from them; but in the earliest stage it is impossible to be sure of the diagnosis—a supposed case of the disease may be one of common jaundice from catarrh of the ducts—and when the disease is fully developed and the malignant character is manifest, no remedies have been successful. Frerich mentions a case supposed to be of this disease, which recovered under the use of cathartics and mineral acids. Under the supposition that the disease is a diffuse inflammation of the parenchymatous structure of the liver, Bartholow advises free doses of quinine, and as it will probably do no harm, and from the analogy of its effects in other cases, it is, in my judgment, worthy of a trial, especially in those cases where febrile conditions are present. Phosphorus is also suggested, given early from the notion of its acting specially upon the liver, and with the hope that an antagonism may be discovered between the action of this remedy and the disease. In a disease so desperate, experimentation of this kind is not only justifiable but commendable. Nothing can be hoped from remedies unless early given. Tissues destroyed cannot be restored. However, all rational indications should, as far as practicable, be fulfilled. The more prominent and distressing symptoms should be palliated, the vomiting checked, the hemorrhage arrested, the constipation overcome, the action of the skin and kidneys promoted, the stage of excitement should be soothed, and during the stage of stupor, coma, and failure of the heart's action, the strength, so far as possible, should be sustained. The ordinary means for fulfilling these indications should be used.

FATTY DEGENERATION OF THE LIVER.

The liver, like other organs of the body, is subject to fatty degenerations, the fat taking the place of the proper tissues.

In phthisis the liver not unfrequently suffers in this manner, and more or less fatty change occurs in various other diseases of the liver itself. When there is a general tendency to fatty degeneration of the system, marked by its usual signs, the liver is apt to be affected.

In fatty degeneration there is lowering of nutritive power, either in the system at large or in the particular part involved, as the cause of the condition; and simple loss of functional power, and of all forms of activity, is the result of this degenerative change. The size of the organ is not changed in pure degeneration, and there are no means of positively distinguishing this condition clinically; but it may be inferred when there is failure of liver function, and when fatty changes are found elsewhere in the system. It may also be presumed to exist when the functions of the organ are much impaired in cases of pulmonary phthisis.

As in other cases of fatty degeneration, the treatment is supporting. There are no specific remedies, but every means should be resorted to for the purpose of improving nutrition—dietetic measures and tonics, etc., according to the particular indications presented.

FATTY LIVER.

By fatty liver is understood accumulations of fat in the organ, which do not, however, necessarily replace the normal tissues. More or less fat may be deposited in the liver, especially in persons inclined to obesity, while the person is in fair health, and without special impairment of the function of the organ.

When, however, the quantity of fat is great, the function of the liver is interfered with, and this excessive quantity is the result of some morbid process. In some cases there seems to be an association of fatty accumulation and fatty degeneration—large quantities of fat being deposited, and to a greater or less extent taking the place of the normal tissue—the latter being absorbed away by the pressure of the fat, or, by a change of nutrition, the fat taking the place of the proteïnacious matter of the structure.

Etiology.—Among the causes leading to these morbid conditions are enumerated chronic alcoholism (but where the indulgence is less excessive and the alcohol more diluted than in cases of cirrhosis); excessive alimentation with want of exercise; some diseases of the heart and lungs; certain cachexias—lardaceous degeneration and tuberculous conditions; and in cirrhosis and other diseases of the liver fatty conditions are often present.

Morbid Anatomy.—The morbid anatomy varies in different cases, and in different stages of the same case. In the milder and less morbid forms of fatty liver, produced by want of exercise and free alimentation, or where there is a disposition to general obesity, the fat is probably deposited chiefly in the connective tissue, and the liver is enlarged without any change in its proper parenchymatous tissue.

In other cases, in the early stage, fat globules of small size are found scattered in the substance of the hepatic cells. In more advanced stages, many of these globules have enlarged by coalescence of smaller ones and by fresh deposits; and this process may go on until the liver cells, distended with their oily contents, have much the appearance of adipose tissue.

The deposit of fat is said always to commence at the periphery of the hepatic lobules, and is often limited to that part, and when the change is more advanced and general, it is most at the surface of these divisions. The liver thus affected becomes coarse, dull, opaque, and soft, the proper color yielding to that of the fat. The part when cut or handled is distinctly greasy. The fat mainly consists of olein and margarin, with traces of cholesterin, and in extreme cases forty-five per cent. of the whole hepatic substance has been found to consist of fat.

By these accumulations the liver is enlarged, sometimes to a very great extent; but the enlargement is generally uniform, and the proportions of different parts are nearly preserved.

Symptoms.—The symptoms of fatty liver will vary in different cases. When fat replaces the proper tissue, the function will of course be impaired, and in proportion to such replacement. When the fat merely accumulates without such replacement, the function is less or not at all affected, and no special symptoms may be induced. When the accumulation is great, there will be a sense of fullness, weight, and uneasiness in the region; the gall ducts may be pressed upon and a jaundiced condition produced; and when degenerative processes occur, and the liver fails to perform any of its functions, the symptoms already referred to as evidences of other structural diseases of the liver will ensue. Debility, anæmia, digestive derangements, morbid conditions of the urine, etc., will be present. As fatty changes are, however, so often associated with other morbid conditions, it will often be impossible to determine what symptoms are due to the fatty, and what to the other changes.

The enlargement is distinguished by percussion and palpation, and its fatty character may be inferred from all the conditions of the case, excluding other affections.

Treatment.—The *treatment* of fatty liver will vary in different cases. When it depends upon excesses in food or drink, and upon sedentary habits, these causes must obviously be removed. A saline and eliminative course of treatment, with exercise in the open air and sunlight, will be useful. The reverse of the conditions which produce enormously fatty livers in geese stuffed with food and kept without exercise in the dark, must be insisted upon.

When it depends upon other diseases of the liver itself, these must receive particular attention. The taking chiefly of albuminous rather than hydrocarbonaceous foods, tends to diminish the production of fat, and should be advised in these cases where other conditions do not forbid. There are no specific medicines which have an established reputation in this form of disease. The general plan of treatment for obesity would be applicable in some cases.

WAXY, LARDACEOUS, OR AMYLOID LIVER.

Phenomena and Diagnosis.—This is a degenerative change in the liver, in which there is a deposit having the appearance of wax, or lard, or boiled starch, and which when treated with iodine gives a reaction resembling that of starch. Hence its names. In this disease there is much uniform enlargement of the organ, with a general condition of anæmia and debility, slow in progress, but usually progressive and persistent. It is apt to occur in disease of the bones and in protracted suppurations, and is sometimes associated with chronic phthisis, with syphilitic dyscrasia, and other cachectic conditions. The spleen is usually affected in a similar manner at the same time, and not unfrequently the kidneys and other organs. It is sometimes associated with leucæmic conditions; and when it reaches an advanced stage is almost always fatal. In some cases, however, as when it arises from disease of the bones, or from protracted suppuration, the removal of the original morbid condition will, it is thought, arrest the lardaceous degenerative process when not too far advanced. Though generally associated and apparently caused by other morbid states, it sometimes appears as the original, or at least the principal recognizable condition.

The diagnosis, before sufficient enlargement has occurred to be detected by physical examination, is perhaps impossible; and after such enlargement it must depend much upon evidences of causation, the occurrence of similar degenerations in other parts, upon the anæmia and debility which are present, the derangement of the bowels, a persistent diarrhœa which is sometimes an attendant, and the exclusion of other hepatic diseases.

Peritoneal dropsy and jaundice rarely attend the disease, and pain referable to the region is usually absent. Leucin and tyrocin are usually found in the urine, but this is only indicative of the failure of liver power from whatever cause, and is not distinctly characteristic of a lardaceous liver. It may, however, be taken into the account in determining the diagnosis.

Amyloid liver is particularly to be distinguished from fatty liver, cancer, inflammatory enlargements and suppurations, and from hydatids. The history, the accompanying conditions, and the particular character of the enlargement as discovered by palpation, will serve to make the differential diagnosis.

Prognosis.—This, as already intimated, is exceedingly grave, and when the disease is much advanced, is fatal. It is, however, thought that some cases have recovered; but the uncertainty of an early diagnosis, especially in idiopathic cases, is such as to leave doubt on that subject. As before stated, when it depends upon causes which are removable, such as suppuration and diseases of the bones, recovery is possible.

Morbid Anatomy.—The morbid anatomy, according to Rindfleisch, is as follows:

The lardaceous change takes place in what he calls the arterial zone of the hepatic lobules, situated midway between their centre and periphery, and involves both the minute arteries and capillaries of the part, and also the hepatic cells. The morbid process, however, soon extends to the central part of the lobules, and after a time to the periphery as well. The change is attended with thickening of the affected vessels, which also become homogeneous and pellucid. There is also considerable enlargement of the hepatic cells, which lose their normal appearance and resemble small vitreous masses, which in time break down into irregular fragments.

In its gross appearance the lardaceous liver is smooth, heavy, and of a doughy consistence; and if uniformly affected, as is usually the case, it presents a homogeneous surface of a grayish tint, with a peculiar glistening or semi-transparent waxy aspect. It is usually free from biliary and sanguineous congestion, and from much moisture. Cirrhotic, fatty, and syphilitic changes are sometimes associated with it.

The increase in bulk of a lardaceous liver is a slow process, and may extend over some years, but the size which it attains is sometimes very great; its weight sometimes being from ten to fifteen pounds.

The cachectic symptoms which occur .in cases of lardaceous liver may in part be due to the causes producing this disease; but admitting the views taken of the functions of the liver to be correct, there can be no doubt that its extensive disorganization is sufficient to account for the disastrous results which follow.

If the liver has an important part in the production of blood, anæmia is the natural result of its degeneration; and the general failure of power, œdematous effusions, etc., would as naturally follow. The co-existence of similar disease of the kidneys, spleen, and other organs, would of course add to the general derangement.

Treatment.—The treatment of lardaceous liver will consist chiefly in endeavors to remove the causes which produce it, and to sustain the energies of the system. If there be diseases of the bones, suppurative processes, malarial poisoning, a syphilitic condition, or other morbid states tending to the production of the disease, they should receive careful treatment. Aside from fulfilling the causal indication, supporting and palliative treatment will be required. A proper dietary should be prescribed, bitter and ferruginous tonics may be given, and the effects of muriate of ammonia, iodide of potassium, syrup of iodide of iron and manganese, or of iodide of ammonium, may be tried. In one case the muriate of ammonia, in scruple doses three times a day, continued for some weeks, was well borne by the stomach, and appeared to produce improvement of the general symptoms; and there was certainly a check in the progress of the disease which lasted for some months, after much advancement had been made; but the disease at length resumed its course and terminated in the usual fatal way. The post-mortem examination showed the lardaceous liver, but no other morbid condition was present which would account for the disease or the consequences which followed. This, as well as some other cases which have been observed, appeared to me to be idiopathic, rather than symptomatic of any other morbid state.

HYDATID TUMORS OF THE LIVER.—ECHINOCOCCUS OF THE LIVER.—CYSTIC DEGENERATION OF THE LIVER.

By these terms is meant cystic growths in the liver, produced by and containing the scolex of the immature stage of the tænia echinococcus. The minute embryos of this parasite gain access from without to the intestines, and reach the liver either by the portal veins or the bile ducts, and by their presence excite the formation of cysts, sometimes one, but often more, which may attain a very great size. These growths, then, depend upon the presence of parasites, which ultimately undergo a variety of transformations that will not here be traced. Various parts of the body are subject to the presence of these echinococci and acephalocysts, but the liver is more so than perhaps any other organ. Though very common in some countries they are rare in this, and their description need not therefore occupy much space.

In the liver, hydatid tumors are often solitary, but there may be two or more; and sometimes they are in other parts of the abdomen as well. They vary much in size, are sometimes very small, when they produce no symptoms, but they may be as large as a child's head, and may contain several pints of fluid. They are slow in development, and may continue ten, fifteen, and even, it is thought, twenty or thirty years.

They are globular in form, unless their development is interfered with by fibrous bands or some mechanical causes. They seem to originate in the hepatic substance, displacing it as they expand, and causing a fibroid growth around, which incapsulates them, constituting the cyst. This cyst is filled with a nearly transparent fluid of low specific gravity, but containing common salt. This constitutes the *cysticercus*, or the larval form of a variety of tape-worm having its common home in the dog and the wolf. From these animals, generally from their intestinal excreta, the germs find their way into the human body.

In some cases the hydatid, commencing first as a minute globular body, undergoes no change but that of increase of size; but in most cases other cysts are formed in the walls of the primary cysts, which often develop and repeat in their growth all the characters of the parent hydatid.

The result, with which we are now interested, is a tumor or tumors in the liver, which in time are so large as to be discovered on palpation, and in their progress may cause pressure, irritation, and inflammation, and thus interfere with the functions of the liver and other organs. Not unfrequently the parasites contained in these cysts die, when the tumor degenerates and contracts.

But the cysts may be ruptured, and inflammation and suppuration, sometimes of a fatal character, may follow.

Symptoms.—These tumors seldom produce pain unless by their pressure, or when inflammation is excited. Their growth is so gradual that the parts become accustomed to the pressure, and it is not until they attain a considerable size that they produce symptoms or can be detected. By their pressure upon the bile ducts they may cause obstruction and jaundice, but this is unusual. When situated near the hilus of the liver, they may not only obstruct the bile ducts but the portal vessels, producing the results of portal obstruction. In case of great enlargement a variety of symptoms may be produced by the pressure, according to the direction the tumor takes. These can readily be imagined and need not be particularly described. When the case comes under the observation of the physician, a tumor is commonly felt in the abdomen, and the question will arise as to its character. Hydatids are generally rounded in form, and tense and elastic to the touch, and frequently present a peculiar thrill on percussion. By placing one hand flat upon the tumor, and percussing sharply with the fingers of the other, a peculiar long-sustained tremor is felt, which has been compared to the "tremor felt on an iron railroad bridge when a train of cars is passing over it."

A well-defined tumor, evidently connected with the liver, presenting these signs, unattended by pain, fever, or any cachexia, with a very slow growth, and which has long continued, can scarcely be confounded with any other affection. It may, however, extend upward, and, when of large size, press up the diaphragm and lung, and simulate effusion in the chest, or consolidation of the lower part of the lung. Extending downward it may simulate fluid in the peritoneum. The history of the case, the descent of the tumor from above downward, its not extending to the flanks, and the irregular enlargement of the abdomen, etc., will distinguish it from this affection.

It may be distinguished from distention of the gall-bladder by the situation and pear-shape of the latter, and by the absence of jaundice.

Abdominal aneurism is excluded by the absence of the aneurismal pulsation and thrill, and by the severe pain so often attending aneurism; but if an hydatid tumor is situated over the aorta, a pulsation may be communicated to it which may strongly resemble an aneurism.

But a demonstrative diagnosis can be made by obtaining some of the fluid by means of an exploring puncture with a hypodermic syringe and exploring trocar, or an aspirator. This fluid may contain fragments of the parasites—the characteristic hooklets—or shreds of the striated hydatid membrane; but, without these signs, the quality of the fluid itself is characteristic. It is limpid or slightly opalescent, it is alkaline, with a specific gravity very slightly, if at all, above water; it is free from albumen and urea, but is strongly impregnated with common salt, which throws down an abundant white precipitate when treated with a solution of nitrate of silver. Such careful exploration would do no harm should the tumor be an aneurism, or cancer, or anything else, and should, therefore, be resorted to whenever there is doubt.

Treatment.—The treatment of hydatids of the liver is a matter of importance. Several accidents may happen with them, producing effects more or less serious, indeed not unfrequently fatal. They may burst, and the contents be discharged in situations where they will do much harm. There may be suppuration within the sac; when large they may do harm by pressure, and they are seldom cured when left to themselves.

The object of treatment should be to destroy the vitality of the echinococci and the parent cyst. Of course no medicine taken into the stomach can be supposed to produce that effect. The electric current, passed through the tumor by needles introduced into the sac, has been found to accomplish the desired result.

A better method, however, is to remove the fluid by aspiration, which has been found to be successful in destroying the parasites. The operation is simple, and usually devoid of danger. The aspirator should be introduced at the point nearest the surface. If not successful, or if another tumor should make its appearance, the operation can be repeated. Injecting the cyst with a very weak solution of iodine has been advised, and if the simple withdrawing of the fluid should fail, this might be tried.

If an hydatid sac should suppurate, it should be opened with the proper precaution and treated substantially like an hepatic abscess, which, in fact, it has become. By a careful examination of the pus, some of the minute hooklets, which are peculiarly indestructible, may be found, and these would determine the hydatid origin of the abscess.

The occurrence of other accidents, such as rupturing, or pointing, or pressing in deep and inaccessible directions, producing inflammation, pain, etc., must be treated by palliative measures, according to symptoms; but the aspirator must be brought into requisition whenever available, and in most cases this very useful instrument can be made so.

After the evacuation of a large cyst by this instrument, a bandage should be applied about the body to keep the walls as closely together as possible, and the patient should be kept very quiet. Should even a moderate quantity of fluid escape into the peritoneum, severe peritonitis would be likely to follow. It should be mentioned that a serous fluid is generally exuded into the sack after the operation, and often distends it to its former dimensions ; but this fluid destroys the life of the parasite, and when this is accomplished the fluid will generally be absorbed and the cyst ultimately become obliterated. A repetition of the operation is seldom necessary.

In places where dogs are numerous, and where, without proper precautions as to cleanliness, they are in intimate relations with human beings, hydatids are common. In Iceland they produce a large proportion of the mortality ; and in some other localities where dogs abound, and their excrements become mingled with the dry dust of the streets, germs are taken into the lungs, and hydatids are developed there in numerous cases. These facts suggest the prophylactic measures—the avoidance in every way of the excrement of dogs.

Simple cysts are sometimes found in the liver ; and are unfrequently in connection with cysts in the kidneys and other parts of the body.

They vary in size from simple points to that of an orange. They are sometimes solitary, and are then usually situated near the centre of the anterior edge of the organ. Sometimes they are present in very large numbers, variously grouped, and of different sizes. Neighboring cysts sometimes coalesce, forming more irregular single ones. They have generally thin walls, which are lined with pavement epithelium, and are usually filled with a transparent serous fluid. Some of the smaller cysts contain a darker gluey mass, similar to some cysts found in the kidney.

These cysts have no clinical history, and as a rule are only recognized post mortem. They contain no echinococci, and should not be confounded with hydatids.

The *liver fluke*—distoma hepatica—a leech-like parasite of two or three inches or more in length, has been found in the human liver occupying the biliary ducts. These parasites in some situations are often found in sheep, producing in them a peculiar form of anæmic disease ; but in the human subject the clinical history of their effects is unknown ; and this simple mention of the subject is sufficient in a strictly practical work.

CANCER OF THE LIVER.

This is not an uncommon affection. The liver is sometimes the original seat of a cancerous growth, but much more frequently the disease in this organ is secondary. It is very common in cancer of the stomach, as has already been mentioned. After the extirpation of cancerous tumors in other situations, the liver is not unfrequently the seat of a new development.

All the different kinds of cancer—cerebriform, scirrhous, colloid, and melanotic—are found in this organ. There are sometimes distinct nodulated tumors, hard or soft, of different sizes, or there may be a combination of both ; and at other times, but more rarely, there is extensive and nearly uniform cancerous infiltration. The liver then often attains a large size, sometimes nearly filling the abdomen, and presenting, on *post-mortem* inspection, a marbled appearance with many shades of color.

When cancerous tumors come to the surface of the liver, they generally approach to a circular form, and as they grow more at the margins than in the centre, they are apt to present a cupped appearance, with a depression in the centre, appreciable to the touch. When observed, this appearance is quite characteristic, and will aid in the diagnosis. It is not always present, however. Springing from a harder mass beneath, soft, elastic points are frequently observed; and this too is quite characteristic of cancer. While the marginal growth is going on, in the central part the process of disintegration and decay may commence, and on cutting the tumor through, a cavity may be found filled with a disintegrated mass or a watery or milky fluid.

The cerebriform cancer is the kind most frequently met with ; but besides the others already enumerated, cylindrical-celled epithelioma or adenoma, secondary for the most part to the same disease of the stomach or intestines, is sometimes found. There may be distinct, independent tumors, but the change seems more particularly to affect the capsule of Glisson and the interlobular tracts, and sometimes follows up the ramifications of the portal vessels in continuous prolongations, or developing here and there moderate-sized tumors. In cancer of the omentum, the liver is apt to be secondarily affected ; the morbid process being propagated along the capsule of Glisson, involves and compresses the veins and ducts, obstructing circulation or causing jaundice. Cancerous enlargement of lymphatic glands in the region may occur, and interfere with the vessels and their circulation.

The symptoms of malignant disease of the liver are not widely different from those which attend other structural diseases of the organ which have been described. There are alterations in the form and size of the organ, with local pain and tenderness—the latter not so much in the tumor itself, as in its surroundings. There is impairment of functional activity by pressure upon, and involvement of the hepatic structure; sometimes there is mechanical interference with other organs; there is impairment of general nutrition; and sooner or later the cancerous cachexia appears.

The change in form and size has already been indicated, and a careful examination will detect the peculiarities. The diagnosis will be obscure early, and it will be impossible in a given case to determine the commencement of the disease. It is much more easily distinguished when a primary cancerous disease has been present elsewhere. Then any change in the condition or functions of the liver will at once excite suspicion. No definite diagnosis, however, can be made until a tumor or enlargement is discoverable, and then the peculiar characteristics will be noticeable, and the diagnosis may be arrived at.

The disease, like every other form of internal cancer, is always fatal; and usually within six months from the time of detection.*

Diagnosis.—Its steadily and rapidly progressive character will constitute one means of diagnosis. When a biliary duct of considerable size is obstructed by a cancerous growth, decided jaundice may be induced; and in a case recently under observation, where a scirrhous tumor was found to have completely obstructed the common duct, the jaundice for some ten days before death was exceedingly deep and intense.

Although the pain, the cachexia, and the tumor of the liver are generally present, death may in exceptional cases result when none of these conditions are marked. When the cancerous degeneration is in the interior of the organ there may be no pain or appearance of a tumor, and no perceptible enlargement; and occasionally the flesh keeps up, with an absence of the special cachectic appearance, till near the last. Jaundice is frequently absent; and dropsical effusion in the peritoneum, though sometimes occurring, is generally not marked.

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* This statement, at present, must be regarded as justifiable, though supposed cases of cure have been reported. One remarkable case has lately been stated to me from an entirely reliable non-professional source, but which occurred under very competent and even eminent professional observation.

A lady of distinction was affected with a cancerous growth of the uterine cervix, which was removed by a surgical operation.

Soon after, a tumefaction of the liver commenced, which was pronounced cancerous by three eminent practitioners.

The husband, a gentleman standing high in the scientific world, requested a trial of the cundurango, an article which a few years ago produced so much sensation as a cure for cancer. It was used freely, and in a few weeks the tumor disappeared. The article has been continued since, and the lady, after some three years of its use, is now in fair health. Whether there was an error in diagnosis it is impossible to say; but the entire failure of the remedy to produce any effect on cancer in numerous other cases destroys confidence in its virtues, if it does not prove it useless.

Carcinoma of the liver should be distinguished particularly from chronic abscess and inflammatory induration, from hydatids, and from amyloid degeneration and enlargement. The nodulated, irregular enlargement, the history, the persistent development, and the cancerous cachexia will serve to distinguish it from other affections. In those rare cases where the cancerous infiltration is uniform there may be difficulty in distinguishing it from an amyloid liver, but there is generally a history of cancer elsewhere which will aid the diagnosis.

Treatment.—The treatment of cancer of the liver must be symptomatic and palliative. The pain or soreness during the earlier stages, when moderate in degree, may be relieved sufficiently by external anodyne applications, and the internal use of belladonna, conium, or hyoscyamus. For the severer cases and the latter stages, opium and its preparations are more efficient and should not be withheld. Whatever particular symptoms may appear should receive proper attention. If peritoneal effusion is too great to be borne, tapping, rather than the administration of hydragogue cathartics, should be resorted to. Measures should be used to keep up the strength and endurance of the patient; a good diet, and often tonic medicines—the object being to prolong life and relieve suffering as much as possible. Specific remedies, such as the cundurango and Chian turpentine, may be tried when borne without injury, but the effects are too doubtful to inspire much hope.

BILIARY CALCULI.—GALL-STONES.

Phenomena.—These are concretions formed in the gall-bladder or the bile ducts, from the elements normally held in solution in the bile. There are several varieties, depending on their composition.

Some are composed chiefly of cholesterin, some of cholochrome, some of bile acids, some of fatty acids, and some of carbonate of lime. A large proportion, however, are mixtures of two or more of these elements in varying but considerable quantities.

Cholesterin is the most abundant ingredient—on an average seventy to eighty per cent. of the entire material—and calculi composed of this alone are light colored, have a somewhat crystalline frac-ture, and readily float upon water. Most of these gall-stones, however, are of a yellowish brown color, though some are reddish or greenish black, varying in specific gravity, most being lighter, but some heavier, than water. They vary in size from small granules to a mass which will nearly fill the gall-bladder, though such extreme size is very unusual. They seldom exceed the size of a pigeon's egg, and the most common size is about that of a beech nut. There is sometimes a solitary one, but generally they are multiple, and sometimes exceedingly numerous, including the smaller ones, amounting to hundreds. They may be all collected in the gall-bladder, or may be in groups in dilatations of the ducts, or may be scattered in different parts, isolated from each other. When isolated they generally assume a rounded form, but when together they take more irregular, and often somewhat angular shapes; and commonly have one or more facets from pressure against each other. They are usually smooth upon the surface, but sometimes granular and rough, and most of them have a soapy feel. Cut through so as to expose the interior, they are sometimes uniform in appearance, though in other cases there is a centre mostly composed of pigmentary matter, sometimes shrunken in appearance. Around this is a zone of variable thickness which is more homogeneous, but marked with radial lines, and around this still another larger zone concentrically striated. The different laminæ often differ in composition, and the outer shell of a large calculus is often composed largely of the salts of lime.

The cholesterin in the bile is normally held in solution by the taurocholate of soda. When this latter is deficient, precipitation of the cholesterin is the result; but this is in small crystals, and would pass off through the ducts with the bile provided no obstruction existed. However, when retained in the ducts or long in the gall-bladder, aggregations occur and calculi are thus formed. The coloring matters, which often form the nucleus of the gall-stones, are detained from similar causes, and similar results follow; but doubtless the morbid quality of the bile, as well as the condition of the ducts, contributes to the production of the calculi. According to Jaccoud, the most frequent cause of the formation of these calculi is the partial decomposition of the biliary fluid by the mucus cast off in inflammation of the ducts and gall-bladder, diminishing its solvent power. When a calculus is formed, its presence in the biliary passages both excites irritation and inflammation, and causes obstruction of a free flow of the bile; and hence one calculus is so likely to be followed by another, and large accumulations quite frequently occur.

The results of biliary calculi vary. Not unfrequently they produce no symptoms, as they are sometimes found in the gall-bladder or bile ducts, *post mortem*, when their presence had not been suspected. When, however, they pass from the gall-bladder or the deeper parts of the liver, where they may have been long imbedded, into the ducts, and are in course of exit, and especially when in the common duct, they often cause severe attacks of pain, or fits of the most severe "bilious or hepatic colic." The symptoms of this are a severe, sudden, often catching, tearing, or burning in the region, coming on in paroxysms, or with marked exacerbations, often accompanied with faintness, retching and vomiting, a depressed pulse, and not unfrequently rigors, commonly followed by more or less tenderness and a jaundiced condition. The pain is sometimes not as severe, and it generally radiates more or less to the umbilical region or lower part of the abdomen, to the back or top of the shoulder; and often a severe sense of tightness or constriction is felt. The obstruction of the ducts by the calculus is not always sufficient, however, to cause jaundice, and the calculus often passes into the intestine with sudden relief of the pain and rapid subsidence of all the symptoms. The calculi may then be found in the stools, which will be the only absolute proof of their passage, or, indeed, of their existence. This search, in such cases, should be made. The stools, for some days afterward, should be mixed with water, and should be reduced to a liquid state, by stirring with a stick, and, when poured out upon the ground or passed through a sieve, the calculi, if present, will be discovered.

Sometimes fits of pain come on, lasting for hours or a day or two, and gradually subside without the sudden relief, and without the passage of a calculus. The paroxysms are then likely to be repeated before long, and when a calculus passes which has facets upon it, others are left behind, and other similar attacks are liable to occur.

In some cases the pain may suddenly cease by the calculus slipping back into the gall-bladder or passing into a more distensible portion of the duct, and ceasing its motion. The attacks, in these cases, are liable to be soon renewed. Inspissated bile, or calculi but feebly consolidated, may produce similar symptoms, and, when passed into the intestines, may be disintegrated so as not to be recognized in the stools; or calculi passed from the liver may be lodged for an indefinite period in the cæcum or other part of the intestines, so that finding no calculi in the stools is not proof of their non-existence, while finding them is demonstrative of the diagnosis.

In cases where the calculi are in the gall-bladder they may remain there and become impacted, causing inflammation of that part, with more steady pain and soreness, with febrile symptoms; and suppurative and ulcerative processes may be induced. Sometimes the calculi and the pus at length pass through the duct and are discharged from the bowels; but in other cases an ulcerative process may cause a rupture of the gall cyst, with passage of its contents into the peritoneum, or adhesions may form and the matter may take various courses—sometimes into the colon, the stomach, or other parts of the alimentary canal, etc., or through the abdominal parietes. The calculi may become impacted within the liver or after leaving it, and similar inflammatory, suppurative and ulcerative processes may follow. These perforating processes may entail protracted suffering, or more speedily prove fatal. A complete obstruction of the common duct is also followed by fatal results. Occasionally, though rarely, death is produced by the shock of an attack of the severe, agonizing, paroxysmal pain, vomiting, etc., which constitute the biliary colic, this final event being preceded by convulsions, sometimes by great depression, colliquative sweats, and collapse. In the ordinary cases, though the pain is severe and the vomiting may be very troublesome, there is usually but little fever, though a degree of soreness follows, and commonly, after a day or two, more or less jaundice occurs.

Not unfrequently, especially where gall-stones are impacted in the liver, an enlargement of that organ becomes sufficient to be detected by a physical examination. This would be due partly to the accumulation of calculi, and partly to the congestive and inflammatory swelling and the hyperplasias likely to result.

In biliary calculi two kinds of pain, it will be observed from the preceding statement, are felt, viz., the paroxysmal agonizing pain, indicating the movements or passage of the gall-stones; and the constant dull pain, indicative of the local irritative and inflammatory effects produced by the prolonged presence of the calculi in the liver, gall-bladder, or ducts.

Attacks of colic from calculi are to be distinguished from hepatalgia or neuralgic pain in the liver, from gastralgia and enteralgia, and from ordinary colic from improper ingesta, etc. The differential diagnosis is to be made by observing the locality of the pain, by the absence of soreness, of jaundice, and of calculi in the stools in the neuralgic pains, and by the history of the case. These attacks may be confounded by a superficial observer with peritonitis; and in some cases peritonitis follows an attack. The symptoms of this latter condition need not again be described.

The diagnosis of gall-stones, when not producing attacks of severe pain, is obscure, and their presence can scarcely be distinguished from some other liver affections.

Prognosis.—A favorable opinion can usually be given when an attack of hepatic colic occurs, but fatal results may follow; and the prognosis as to complete recovery from the disease—the expulsion of the calculi and relief from further attacks—is uncertain.

Treatment.—The treatment of biliary calculi is divided into that of the paroxysms of pain they induce, and that for a prevention of their formation and for the relief of the more permanent morbid states with which they are associated.

The paroxysms, which are often the first marked indication of the existence of gall-stones, are to be treated by fomentations or the warm bath, and the free administrations of anodynes or anæsthetics. Free and repeated doses of an opiate, generally morphine hypodermically, will be required, and when this is not sufficient to keep the pain within the bounds of endurance, the effect may be aided by the inhalation from time to time of ether or chloroform. These anæsthetics may be used in quantities less than are necessary to produce complete unconsciousness, but sufficient to control the spasmodic action and the severity of the pain.

Where opium is not well borne, belladonna may be substituted, and in some cases it succeeds better—producing, it is thought, a more relaxing effect than the ópiates. The latter, however, are very generally more reliable and efficient, and, as a rule, should be used. A combination of morphine and atropia—$\frac{1}{4}$ gr. of morphine and $\frac{1}{180}$ gr. of atropia at a dose, used hypodermically—has been advised, and is perhaps still more efficient.

Large draughts of water, as warm as can be taken, made alkaline by bicarbonate of soda, will act as an internal fomentation and correct any acidity that may be present in the stomach. If rejected, the draught should be repeated, as it often renders the vomiting less distressing.

Sulphuric ether and the oil of turpentine, three parts of the former to two of the latter, formerly had a reputation and were supposed to act as solvents to the calculi; but they certainly cannot be supposed to be brought in contact with them in sufficient quantity to have any effect by that mode of operation in relieving a paroxysm; and it is doubtful whether they possess any useful virtues in these cases. From half a fluid drachm to a drachm was advised as a dose, and the smaller quantity was directed to be taken every morning for a year or more.

For the relief of the paroxysm, and as a means of expelling the calculi, the late Dr. Z. Pitcher, of Detroit, advised large enemas of tartar emetic and laudanum, in a proper vehicle (a drachm of laudanum with from three to six grains of tartar emetic in a pint of water) producing in this way thorough relaxation and an anodyne effect, to be followed soon after by a very large quantity of olive-oil by the stomach. This course has still a local reputation of being peculiarly successful.

The very large doses of olive-oil have been so often reported as followed by the expulsion of biliary calculi as to render the remedy worthy of trial. As soon as the pain is checked by anodynes, and the stomach will retain it, from four to six or eight ounces, or even more, of the oil is to be given, and when the cathartic effect occurs, the gall-stones are not unfrequently found in the evacuations. The dose after several hours may be repeated if necessary.

But however important the treatment of the paroxysms—and by the judicious use of the means mentioned very great relief can generally be produced—the preventive treatment, or the removal of the calculi and of those morbid conditions of the liver, the bile, and the general system which constitute the real disease, is more important still. Efforts may be made, during the interval of the paroxysms, to remove the calculi; and, besides other means, the method of Dr. Pitcher may be tried, and repeated at proper intervals, if not at first successful.

The first object to be aimed at is the correction of the general health, and the removal of such pathological conditions of the liver as may be detected.

The conditions of the digestive organs should receive attention. The alimentation and general habits should be regulated. A simple, moderate, and easily digested diet, containing but little starchy and fatty matter, must be enjoined.

Frequently a course of small and repeated doses of mercury, as a grain or two of blue mass every night, for a week or so, and then less frequently, or in smaller doses, will be found useful; or the twentieth or tenth of a grain of the biniodide of mercury once a day, continued for one, two, three, or more weeks, but not carried to the production of salivation or anæmia; and when the bowels are kept free with saline laxatives, most certainly this treatment is often followed by good effects. On the supposition that some slow congestive or inflammatory action has been going on in the liver, producing hyperplasia of the ducts or of the tissues in their neighborhood, obstructing the free flow of bile, and by its detention thus favoring precipitation of its solid constituents; or on the supposition that its secretion is abnormal, and the bile itself has not its proper composition or proper proportion of ingredients; or regarding the catarrhal inflammation and its resulting mucus as producing changes in the bile and diminishing its solvent power, we may account for the good effects which experience teaches that mercury so often has in such cases by modifying these conditions.

Podophyllin, euonymin, leptandrin, etc., may also, by exerting a modifying influence upon the liver's secretion, correct morbid states which tend to the production of calculi, and these articles are believed often to do good.

But *alkalies*, especially soda, and *diluents* are most to be relied upon. Both theory and experience point to their use. As cholesterin is believed to be kept in solution by the taurate of soda, supplying one of these ingredients favors that action; and the free use of diluents certainly renders the bile more liquid, as experiments upon animals prove, and the greater liquidity of the bile must tend to keep its solid constituents in a dissolved state and prevent precipitation. Theoretically, the cholate of soda would be specially indicated; and this has been recommended by different practitioners. The dose prescribed has been from five to seven or eight grains twice a day, to be suspended from time to time and for considerable periods, if gastric irritation occurs. It has not yet been sufficiently used to test thoroughly its efficacy.

The hydrated succinate of the peroxide of iron, an ounce and a half to six and a half ounces of water, a table-spoonful after each meal—the remedy to be continued for several months—has been recommended; but, as in the case of the preceding remedy, its practical utility can hardly have been sufficiently tested. Both of these articles are perhaps worthy of further trial.

When alkalies are used for a long time, they must be given so as to interfere as little as possible with digestion, and the salts with organic acids should, as a rule, be preferred.

The acetate, the tartrate, or the citrate of soda, given after digestion is completed and in free solution, should be persevered in. Even if these articles do not act as solvents upon calculi already formed, they tend to prevent their formation, and should be continued faithfully. Phosphate of soda, in doses of from ℈ijss to ʒj, in a large solution before each meal, for several months, is particularly advised by Prof. Bartholow, and may be quite as useful as the other salts of soda recommended. If decomposition of the salt takes place in the system, the phosphorus may exert some peculiar effect upon the liver, and the soda may produce its peculiar alkaline effect on the bile. Whatever its mode of action, experience seems to have shown that a long, persistent use of this salt is often followed by decided beneficial effects.

Other salines, particularly the sulphate of soda, which, according to the experiments of Dr. Rutherford, markedly increases the flow of bile, will also be of service. The waters of Carlsbad, so celebrated in the treatment of biliary calculi, contain this salt as their chief ingredient. The "cure" at this favorite spring consists in drinking early in the morning, an hour or more before breakfast, a large quantity of this water, sufficient to produce a laxative effect; and this is pursued for some weeks. Other alkaline and saline springs have a reputation in these cases, and hot spring baths cause absorption of water from the surface and wash out the system.

Whatever else is done, the free drinking of water should be practiced. Habits of out-door exercise in pure air are particularly important.

Special symptoms should be met, as they arise, with appropriate remedies.

JAUNDICE.—CHOLÆMIA.

By jaundice is understood, as heretofore stated, the presence of bile in the blood, the tissues, and the urine, and generally a deficiency of it in the alimentary canal and in the alvine discharges.

The icterode or jaundiced condition has already been spoken of as a symptom of various pathological states, and some remarks have been made upon its pathology as it presents itself in different conditions. A few more observations of a practical character, especially upon its diagnosis and treatment, seem to be called for.

The general phenomena—the yellowness of the skin, the adnata, and other tissues; the presence of *bile elements in the urine;* the dyspeptic symptoms; sleepiness, heaviness, etc., and occasional evidences of severe blood poisoning, have been mentioned. Usually, however, other symptoms, due to the pathological conditions of which the jaundice is one of the expressions, are present. Many of these symptoms were also pointed out when the diseased states producing them were described.

Diagnosis.—In the *diagnosis* of a case in which the icterode condition appears to be present, the tracing out of all the pathological conditions is required; but to distinguish the jaundiced condition from all the appearances resembling it is important. There are several diseases presenting appearances more or less simulating jaundice, for which it may be mistaken, and from which it should be differentially diagnosticated.

1. Chlorosis. In this there is a yellowish skin, but it has a greenish shade, and the eyes instead of being yellow are pearly white; there is pallor of the prolabia, anæmic murmurs of the heart, and usually amenorrhœa. The *freedom of the urine from bile* is the most conclusive test, and the examination of this secretion in a doubtful case should never be neglected.

2. The cancerous cachexia often presents a degree of yellowness of the skin, but it is a grayish yellow, with often a greenish tinge, not

as deep a color as is usual in jaundice, and the *conjunctivæ and the urine are clear.* Some other visceral diseases may cause sallowness, but without jaundice.

3. In malarial fever, long continued, a yellowness of the skin is seen, but if the eyes and urine are clear, a jaundiced condition is not present. Jaundice, however, often complicates malarious diseases.

4. The lead cachexia produces a sallow complexion, but the color is different from jaundice, other evidences of the lead poisoning are present, and the clear eyes and urine are again important diagnostic features.

5. Fatty degeneration of the skin, in persons of light complexion, presents an appearance much resembling moderate jaundice. There is also not unfrequently an amount of yellowish subconjunctival fat, giving a yellow appearance to the eyes. This change of color comes on slowly, there is general and persistent debility, and the urine test of jaundice is absent.

6. The yellowness of the skin of infants three or four days old resembles jaundice, and is often called so ; but it depends, usually at least, upon a change in the blood in the skin, and differs from jaundice.

7. The bronzed skin of Addison's disease may be mistaken for jaundice. The color, however, is darker, with less of a yellow tint; it approaches gradually, is less uniform over the body, and the eyes and the urine are again clear.

8. Exposure to the sun in hot climates produces a color which may suggest jaundice ; but the absence of other symptoms of jaundice, and the urine test, will prevent confounding the conditions.

9. The change in the pigmentary condition of the skin in different parts of the body, called cholasma or "liver spots," does not constitute jaundice ; and the mossy color of the face in some cases of anæmia, pregnancy, etc., differs widely from jaundice ; and both of these should readily be distinguished from it by the tests of the eyes and urine already repeatedly mentioned.

10. Jaundice may be feigned by coloring the skin with turmeric ; but the eyes cannot be colored, and the urine will not contain bile.

11. The color of the urine, as will be noticed, is an important indication of jaundice, but there may be other coloring matters in the urine besides bile. Blood especially gives the urine a dark color, and the particular microscopic and chemical tests must be used. The blood corpuscles can be seen by the microscope ; and when bile is present, the peculiar play of colors when treated with nitric acid, and the other special tests for bile pigment and bile acids, must be observed.

In jaundice, not only the skin and eyes, but all the tissues of the body may be tinged with bile, and it may be detected in the blood; and not only does the excretion from the kidneys contain bile, but often the perspiration also, and in such quantity as to give a marked yellow stain to the linen.

The tint of the skin varies from a light yellow to a deep olive hue; is often deeper in some situations than in others; and sometimes a bronzed color is seen.

There is a bitter taste in the mouth, with deranged appetite and digestion; a slow pulse, sometimes twenty or thirty beats below the normal; often a yellow vision, more or less debility, and not unfrequently quite decided cerebral symptoms; but these latter are generally due to other conditions than the mere retention of bile. The failure of the metamorphic function of the liver—failure to prepare effete matters for elimination—and their retention in the blood and tissues are more likely to be the cause of the cerebral disturbance.

The two classes of jaundice are to be borne in mind: the *one* in which there is a *mechanical impediment* to the flow of bile; and the *other* in which there is no such impediment. The pathology of the first is more clear. That of the *second* has points which are still in dispute, but which have been sufficiently pointed out.

Treatment.—In the treatment of jaundice the pathological conditions must govern; and these have been dwelt upon. But the symptoms must at the same time be palliated. There are two classes of phenomena which require attention in removing the symptomatic effects of the pathological conditions—or the jaundiced state. These are, 1st. Those arising from bile in the blood and tissues; and 2d. Those from absence of bile in the alimentary canal. For the first condition—bile in the system—*eliminatives* are indicated—cathartics, diuretics, diaphoretics and cholagogues. Various articles under each of these heads have a reputation, and properly employed are useful. For the second—a want of bile in the alimentary canal—ox gall in capsules is the chief remedy. It is thought that bitter tonics—quinine especially—and alkalies may to some extent supply the place of bile in the intestines; but the bile of the ox contains all the essential elements of human bile, and is exactly the article needed to aid the digestive processes, which the secretion of the human liver accomplishes.

The cholate of soda, an element of the bile, has also been prescribed in doses of ten grains three times a day. This and the bitters and alkalies may be used as aids to the intestinal digestive process, especially in the absence of the oxgall.

It should be borne in mind that when the ductus communis choledochus is obstructed, the pancreatic secretion is prevented from entering the intestine, as well as the bile; and this may suggest the use of animal pancreatin as well as oxgall; and it is impossible to say how much influence the retention and reabsorption of the pancreatic fluid may have upon the system. The possibility of morbid effects from the presence of this secretion in the blood also suggests eliminatives.

When the liver is distended by bile in the ducts, and the gall bladder is full and tense, giving rise to pain and irritation, the suffering may be palliated by anodynes and fomentations, and the taking of much fluid should be avoided. The larger the quantity of fluid taken, the larger will probably be the bulk of bile secreted.

It must not be forgotten that jaundice is a symptom of a variety of pathological conditions, the overcoming of which may require a variety of means, and that it cannot be properly treated by its name. The treatment for the common form of jaundice arising from catarrh of the bile ducts has been given. Various other pathological conditions producing jaundice among their effects, have been treated of, and need not be further discussed.

When jaundice arises from faulty innervation, nerve stimulants or nerve sedatives, according to the condition, may be called for. If from deficient oxygen, the means for supplying it are to be used—fresh air, proper exercise, etc.—and some medicines appear to promote oxidation in the system, and among them are chlorate of potash and nitro-hydrochloric acid.

If jaundice arises from an excessive secretion of bile, flooding the stomach and bowels and being absorbed in excessive quantities from their surface, emetics and cathartics are the obvious remedies.

If it arises from constipation—the bile not passing off, and being consequently absorbed—cathartics are too obviously indicated to require to be dwelt upon. If from congestion or malaria, the remedies for these conditions are required. If from a typhoid state or from particular poisons, eliminative and supporting measures, according to the conditions, will be required. All this "goes without saying."

A great variety of particular medicines for jaundiced conditions under different circumstances have been named. Thus the natural alkaline and saline mineral waters, or their chemical imitations, especially in jaundice from catarrh of the duodenum and gall ducts, are advised. The phosphate of soda appears to be a special favorite with Prof. Bartholow in this as well as in cases of gall-stones, and, given in doses of a drachm, more or less, well diluted, every four hours, it is doubtless an excellent remedy in many cases. The sulphate of soda is in no way inferior given in a similar way, and may be more efficient in exciting bilious excretion.

The sulphate of manganese, in half a drachm or drachm doses, three times a day, has a reputation, and is doubtless useful in some cases. The chloride of ammonium is often applicable, especially in the subacute cases with catarrhal conditions.

Hydrastis has a reputation, especially with the "eclectic" practitioners, and so has stillingia and irisine. The euonymin has long been in use by the eclectics and as a domestic remedy in this country, and since the report of Dr. Rutherford, before referred to, it has attracted the attention of the profession more generally as a cholagogue.

Podophyllin has also long been used, and in small doses, in combination with alkalies, is often useful. But its irritating effects upon the intestines, and its drastic action as a cathartic, must be remembered. The old remedies, aloes and rhubarb, have their uses in cases of "torpid liver" and bowels; and it is scarcely necessary to say that in jaundice associated with malarial fevers, quinine is the most important remedy, and arsenic and the various other antimalarials will be useful in the cases to which they are appropriate.

The action and use of mercury has, perhaps, been sufficiently discussed. Notwithstanding its utility has been so much questioned, and its excessive use has been so justly and yet often so excessively condemned, it maintains its reputation with most practical physicians, and in various morbid hepatic and gastro-intestinal conditions, accompanied with some jaundiced states, it has no equal for efficiency in the materia medica.

STENOSIS, OR STOPPAGE OF THE BILE DUCTS.

Complete occlusion of the biliary passages, from whatever cause, as from cancer of the pancreas, of the duodenum, or other neighboring parts, the impaction of calculi, adhesion of opposed surfaces by inflammation, etc., or by pressure of hydatids or other tumors, results in serious consequences. When the ductus communis choledochus is completely closed, the liver at once becomes distended with bile, absorption soon takes place, and jaundice results—often intense; and if death does not soon follow from blood poisoning, as has occurred in my experience in at least three cases, the liver undergoes destructive changes, and death in time results. When branches of the duct are occluded, the part of the liver with which the occluded ducts are connected suffers more or less disorganizing processes, and the general effects will be in proportion to the extent of the parts involved.

The occlusion of the cystic duct is not attended by the same effect upon the parenchyma of the liver, but the gall-bladder becomes distended by the accumulation of an altered mucus, and calculi are sometimes found impacted within it. A pear-shaped tumor will be found projecting from under the liver, inflammation and suppuration may be excited, adhesive inflammation may take place, and this cystic abscess may follow the course of other hepatic abscesses. A quantity of pus, mucus, decomposed bile, and biliary calculi may be discharged externally through the parietes of the abdomen, or may burst into the stomach, intestines, or peritoneal cavity, with various results. Recovery, long suffering, or death may be the consequence.

The treatment must be conducted on the same principles as in other hepatic abscesses—but for the most part it will be symptomatic and palliative.

HEPATIC PHLEBITIS.

Suppurative inflammation of the portal and hepatic veins may occur, but generally as a secondary affection. Ulceration in various parts of the intestinal canal, abscess of the mesenteric glands or of the liver, may induce this inflammation of the portal vessels, and suppurative disease of the liver may extend to the hepatic vessels. The clinical history of these affections is not definitely known and not distinctive from other pyæmic, inflammatory, and febrile conditions, and an autopsy can alone reveal the exact diagnosis.

The symptoms will be severe, and the results fatal.

Post mortem the veins will be found with their tunics thickened and infiltrated ; variously discolored, fibrinous, and purulent exudations and thrombi are in the veins ; and when the disease is sufficiently long continued, emboli and secondary abscesses may be found in the liver and elsewhere in the body.

The diagnosis is obscure ; but when, after ulcerative or suppurative disease in the abdomen, pain and tenderness occur in the course of the portal vessels outside of the liver and extend to that organ, hepatic tenderness and swelling come on, jaundice supervenes, and pyæmic fever is developed, hepatic phlebitis may be suspected, and death may be expected in from a few days to a few weeks.

As in other pyæmic and septicæmic fevers the temperature rises to 105° or 106° F.; chills, sweats, and diarrhœa take place ; a dry, hard tongue, a rapid pulse, low delirium, great prostration, and other typhoidal phenomena occur, and death follows either by coma or asthenia.

Treatment is of little avail, but such as has already been recommended in pyæmic fever may be resorted to ; quinine may be given to abate the fever, and, if possible, to check suppuration ; fomentations may be applied over the side and abdomen, and morphia administered hypodermically to relieve the pain and diminish shock. Proper nourishing and supporting agents, as in other similar conditions, will be required.

Thrombosis of the portal veins may occur in the conditions just described, and in various other obstructive diseases, as in cirrhosis, chronic atrophy, cancer, and other tumors.

The symptoms, if recognizable, would be a sudden increase of the evidences of portal obstruction—such as intestinal and splenic congestion, a watery diarrhœa, distention of hemorrhoidal veins and of the communicating veins over the abdomen, and general derangement and prostration. If the obstruction approaches completeness, death will soon follow. Ammonia has been suggested as a remedy tending to dissolve coagula, but the prospect of introducing a sufficient quantity into the veins to effect that object seems too remote and uncertain to justify much hope. Carbonate of ammonia, in doses of from four to eight grains, in a proper vehicle, may be given once in three hours. An injection of one part of aqua ammonia to two of water into any convenient vein has been proposed ; and it is alleged that such an injection into veins has been proven to be innocent. I am not, however, prepared to recommend the experiment.

Aneurism of the hepatic artery has occurred in a few instances. Attacks of severe pain not otherwise accounted for may occur in the region of the liver, and if the tumor becomes large it may be felt pulsating like other aneurisms. Jaundice is likely to be produced from pressure upon the duct, and the various liver functions are likely to be interfered with. The aneurism sooner or later ruptures, and death takes place from hemorrhage, generally into the peritoneum. No radical treatment is likely to be efficient, but the sufferings may be diminished by anodynes and other palliative measures.

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